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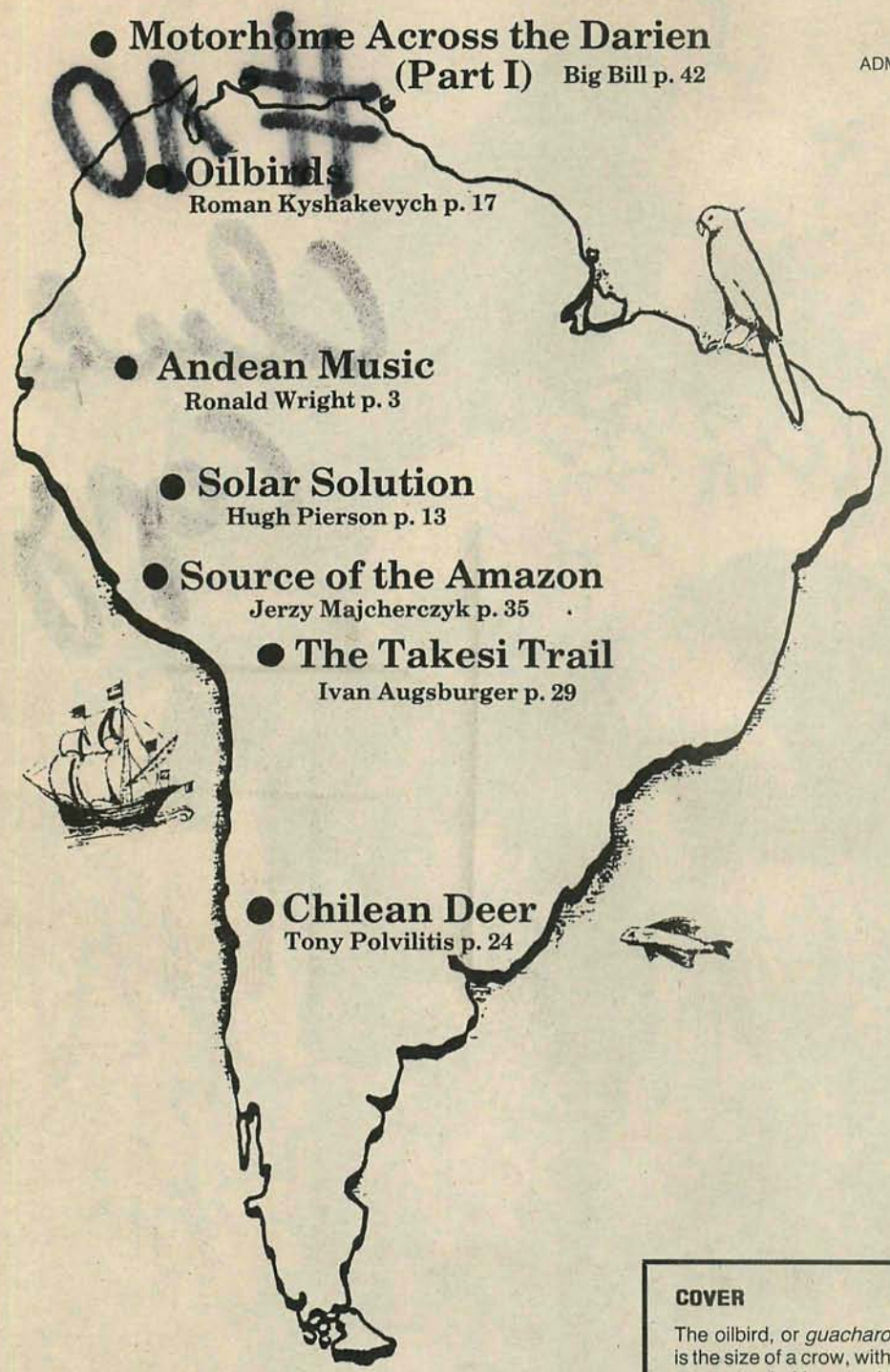

Motorhome Across the Darien (Part I) Big Bill p. 42

Oilbirds Roman Kyshakevych p. 17

Andean Music Ronald Wright p. 3

Solar Solution Hugh Pierson p. 13

Source of the Amazon Jerzy Majcherczyk p. 35

The Takesi Trail Ivan Augsburger p. 29

Chilean Deer Tony Polvilitis p. 24

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COVER

The oilbird, or *guacharo,* first classified by Humboldt and Bonpland, is the size of a crow, with a wingspan over a meter and an enormously strong beak. Younger birds have a thick layer of edible fat between their legs—hence the name. See page 17 for story.

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By Ronald Wright

Andean Music

Ronald Wright is an archaeologist now living in Canada. He has excavated in the Sudan, Gambia and Mexcio, traveled widely throughout South America, and his book, tentatively titled Tawantinsuyo & Peru, is scheduled for publication by Viking Press in spring 1984. (Photo: Benna Kolinsky/SURVIVAL INTERNATIONAL)

In one of history's ironies, numerous in the annals of Peru, the Incas' love of music—specifically their fondness for the aeolian voice of the conch trumpet—revealed the whereabouts of their Andean empire, Tawantinsuyu, to the outside world.

Late in the year 1526 the Spanish pilot Bartolome de Ruiz became the first European to sail Peruvian waters. Soon after crossing the equator, he encountered a large ocean-going balsa raft with cabins and "cotton sails as fine as ours."[1] The vessel, en route to Panama, carried a cargo of Tawantinsuyu luxury products to trade for the great crimson shells of *Strombus galeatus* found in the warm waters of the Isthmus. Used as trumpets these shells have been prized in Peru at least since Chavin times (1000-200 B.C.). Their powerful, eerie, almost electronic hum played an important part in many rituals, and massed blasts terrified the enemy in war.*

The stores on the raft included precious stones, bolts of cloth and brilliantly dyed "moorish tunics." But, alas, the bearded invader's beady eye alighted on a hoard of golden artifacts: crowns and diadems, beaten plates to adorn the body and figurines—a display to whet a 16th century craving for plunder. Most of the twenty Indian sailors jumped overboard, but one of three captives achieved fame six years later as Felipillo, the unreliable translator whose machinations contributed to the death of Atauwallpa in Cajamarca.

Music remains the most enduring legacy of the Inca civilization. How much today's music is directly descended from pre-Columbian times and how much reflects the preservation of archaic colonial influences provokes lively debate among anthropologist and musicologists. Certainly the two traditions are now inextricably woven, but there is still a spectrum, and at one end relatively uninfluenced indigenous forms survive to this day.

An indicator of continuity with ancient times is terminology—the names of instruments, songs and musical forms. Still in use are words of Quechua and Aymara origin, such as *harawi* (song), *kacharpari* (song of farewell), *wayno* (love song and dance tune), *taki* (song or music in general), *kena* (end-blown notched flute), *pinkullu* (same as *kena,* but often larger), *pina-pinkullu* (side-blown flute, often mistakenly thought to be of European origin, but now known to have been present in Chimu times [c. 1400]), *wankar* (large drum), and *tinya* (small drum). The old Inca *haylli* ("joyful victory song after battle or after the sowing of seed"[3]) is scarcely heard today, and the term *kashma,* a type of dance, is being displaced by the *wayno* (from Aymara *waynu,* lover or love song.)

Newer forms have Spanish names, such as the *pasacalle* (a processional tune played in the street for wedding parties or people leaving town) and *marinera* (derived from the Chilean *cueca,* but renamed after the War of the Pacific to honour the Peruvian Navy). A curious dance tune called *fox incaico* (Inca fox-trot!) appears to be derived from the *pasacalle.* All show definite European influence, but Andean musicians infuse an indigenous flavor. Conversely, *waynos* and *harawis* (Hispanicized as *yaravi*) can be almost unrecognizable at the hands of coastal musicians.

In the pioneer study *La Musique des Incas et ses Survivances,*[4] the d'Harcourts found it very difficult to distinguish between native and imported features. They concluded that several characteristics of Andean music (for example the irregular syncopation of independant rhythms—especially noticeable in the harp music—the use of short *estribillos* [refrains] and the rapid foot tapping in the *wayno* and *kashwa* [dances]) may have both Indian and Spanish traditions. They note that neither Garcilaso de la Vega nor the Spanish chroniclers had any hesitation in comparing the Inca *hayllis* and *harawis* to *redondilla* and *seguidillas.* And words of surviving pre-Columbian songs often fit short quatrains that, but for the absence of pure rhyme, differ little from those of Renaissance Spain.

Kaylla llapi	In this place
Pununki	You will sleep
Chawpi tuta	Midnight
Samusaq	I will come[5]

Less than twenty years after the Conquest, Garcilaso[6] recounts attending a Corpus Christi mass in a Cuzco cathedral where the chapelmaster had written a devotional hymn "in perfect imitation" of an Inca *haylli.* The composition greatly pleased Spaniards and Indians alike—a felicituous outcome hardly possible if the two traditions were utterly disparate.

Some may doubt the authenticity of such claims, or the purity of Inca poetry recorded after the Conquest, but the conservatism and tenacity of Indian culture argue for continuity. This is dramatically highlighted by the following song, heard *circa* 1940 in Ancash:[7]

Karanta tinyachisun,	We shall make a drum from his skin
Kirunta wallqakushum,	We shall make a necklace of his teeth,
Tullunta pinkullushun,	We shall play flutes of his bones
Umanchu upyashun.	And we shall drink from his skull.

Not only are the sentiments expressed in this ditty obviously ancient, but an almost exact version of this song was written down three and a half centuries earlier by the Indian writer Waman Puma (Guaman Poma de Ayala).[8] Since Puma's document was not published until 1936, and then only in a limited facsimile edition in Paris, there can be no chance of the Ancash song being a copy of the latter. The words are probably a fair example of the content of *augataki* war songs. It is well known that the Incas enjoyed burlesquing a vanquished enemy by stretching his hide over a frame. The erstwhile foe's taut belly formed a *runatiny* or "man-drum"; his dried arms used waggishly as drumsticks.

But not all Inca music was warlike. Early chroniclers agree that ancient Peru abounded in love songs and poetry. Young men called to their sweethearts with *harawis* played on the *pinkullu* or *kena.* Since the repertoire of songs was known to all, and no two poems shared the same tune, a woman knew her lover's thoughts as he played.[9]

Similar songs were performed in the great *raymis* (fiestas) of the Inca religious calendar. *Pinkullu*

*There were (and still are) many kinds of trumpet, made from bamboo, pottery, gourd and metal; but the aristocrat of them all was the conch *churu mullu.* Later it became known as *pututu* — originally the name of the gourd variety. Besides war and ceremony, it served the *chaski* — the Inca courier — as a post horn.

orquestras with instruments in four sizes equivalent to treble, alto, tenor and bass played the melodies, while choirs of women sang and beat small *tinya* drums. Men always played the flute, which has phallic connotations, and women, the tinya, a division still observed today, expressing cosmic order.

In ancient rites and fiestas, heavy chicha drinking and sexual abandon led to amorous activity in the *chaqra,* the fields, as they do today. In a society concerned with fecundity, love songs and hymns overlapped. For example, in the ceremony of *Wariqsa Harawi,* Waman Puma records the Inca ruler's song imitating the voice of a sacred llama:[10]

"... the Inca begins in the same tone as the animal, saying 'yn—yn—yn'. . .(then) very many *koyas* and *nustas* (noblewomen) sing very sweetly in a high voice:

Harawi yaw harawi. .	Listen to the *harawi*
Haylli ayaw haylli yaw haylli	Listen to the *haylli*
Uchuyoqchu chaqrayki?	Are there peppers in your field?
Uchuy tunpalla samusaq;	I shall pretend to come for peppers.
Tikayoqchu chaqrayki?	Does your field have flowers?
Tikay tunpalla samusaq.	I shall come as if for flowers."

Waman Puma follows with a sorrowful *harawi,* though it is unclear whether it belongs to the same fiesta. It expresses the universal theme of unrequited love like most *harawis* today:

Mana sonqoyki qhewiqchu?	Does your heart not pain you?
Mana waqaykunki?	Do you not weep indeed?
Sikllallay kaspa,	You are my beautiful flower,
Koyallay kaspa,	My queen,
Nustallay kaspa.	My princess.
Unuywiqellam apariwan,	The water of my tears is sweeping me away,
Yakuy parallam pusariwan, Chay lliqllaykita	Like a flood of rain it carries me,
Chay lliqllaykita rikuykuspa,	The sight of your shawl,
Chay aqsuykita qawaykuspa,	The glimpse of your skirt,
Mananam pachapas chisiyanchu.	Keep time from passing.
Tuta rikchariptipas,	I lie awake all night,
Manataqmi pachapaqarinchu.	But still it is not yet morning.

The structure of this 16th century song, with its near-rhymes and repetitions of similar lines, is uncannily close to the standard forms of modern Andean singing one might hear on any juke-box in the sierra.

Professional musicians performed at public *raymis* in ancient Cuzco. Singers and flautists often numbered in the hundreds. Male musicians came from the ranks of the *yanakuna* (helper or servant class), while young girls known as *taki-aqlla* formed a special class of "chosen women" devoted to music: "These maidens were twelve-years-old, chosen for their fine voices. . . (they) sang very sweetly in a high voice. . ."[11] They no doubt sang in the incredibly high female falsetto still typical of the Cuzco region. Modern bands often feature

WARIQSA HARAWI ceremony — An Inca sings with his red llama, imitating the voice of the sacred llama. [Drawing by Waman Puma]

an adolescent singer, as only a young girl can span the required range. (An exception was the Peruvian singer Yma Sumac. Her four-octave voice became internationally famous in the 1950's, though her operatic interpretations were generally far from authentic "Inca" music.)

A popular instrument in ancient Cuzco was the pan-pipe or syrinx (called *antara* in Quechua, *siku* in Aymara and *zampona* in Spanish). Garcilaso describes orchestras with different sized instruments playing complementary parts, as no one *antara* could handle the range of a whole song.[12] Precisely the same arrangement is used in the Lake Titicaca region today where pan-pipe bands seldom have less than a dozen players. On Taquili Island I saw a band with twenty-six pipers who marched in a wide circle to emphasize, in turn, the roles of the different pipe sizes.

Andean music is often described as pentatonic, i.e. based on five notes: *do, re, mi, sol, la.* The d'Harcourts used this scale as a yardstick to judge the "purity" of the music they collected and regarded the presence of semitones as a European influence. They cite as evidence several ancient pentatonic panpipes in museums.

Stevenson,[13] on the other hand, claims that while some ancient *antaras* are indeed pentatonic, many are not. Pipes examined by Stevenson yield a bewildering variety of tones and fine distinctions between microtones in the higher registers. He cautions against confusing pitch series with scale. Nonetheless, several series are repeated in different instruments and cannot

be dismissed as haphazard. Among the pipes studied by the d'Harcourts were two Nazca sets with ten tubes each. These produced the following pitch series, identical in both *antaras* but exactly an octave apart: *fa, la,* flat, *si, re, mi, fa,* sharp, *la, si, re, fa.*

All this points to a complex musical structure yet to be systematically analyzed by musicologists. While most modern Andean music is pentatonic, there is reason to think that it may have been less uniform in ancient times. Interestingly, Lake Titicaca pan-pipe music, which seems to be highly resistant to change, uses the full diatonic scale.

The fiestas of ancient Cuzco, too numerous to outline here, can be found in a detailed and apparently accurate list in Waman Puma.[14] In addition to the macabre beating of man-drums, animal chants and love songs, the recital of prayers and oral histories could be heard at the more solemn feasts. In this fashion, the past was not only preserved, but structured according to mythic archetypes in the great Inca poems. These Quechua equivalents of the Homeric epics have largely been lost, but we know that they were composed and memorized by the Court *harawiq,* the "poets laureate" and performed by the *taki-aqlla* choirs. Pachakuti, an historical archetype himself, is credited with establishing these traditions and, indeed, with shaping the Inca world.

A fascinating dimension of the dances described by Waman Puma must not be omitted. In his drawing of the *"Fiestas de los Antisuyos"* bare chested women and men dressed as women with feather head-dress dance something called the *Warmi Auqa.* Antisuyu, it will be recalled, was the quarter of the Inca Empire corresponding to the eastern Andes (whence their name) and the Amazon jungle. Indian accounts of ferocious female denizens caused Europeans to name the river basin after the famous Classical viragos.

Warmi Auqa is Quechua for "woman warrior" or "woman enemy": Waman Puma's drawing shows the civilized residents of Antisuyu lampooning their dreaded jungle foe. This same custom survives today in the *Chunchu* dances of Paucartambo and elsewhere. Scurrilous imitations of foreign ethnic groups is something that gives Andean folklore its incredible richness. It is perhaps the main reason why obsolete Spanish dances of the Colonial period have survived in parodied form among modern Indians. The *morenadas* performed in the carnivals of Oruro and Potosi are, in fact, spoofs of the dances of long-extinct black slaves brought by the Spaniards to work the mines. In this connection, I hear that the Indians of Chinchero (increasingly a tourist mecca, near Cuzco) are starting a new dance troupe to be called "Tourists." Of course, not all European influences were absorbed in a satirical vein.

INDIAN IN Spanish dress sings to a lady in her native dress and Spanish accessories. See page 7 for translation. (Drawing by Waman Puma)

Spanish culture did little to excite the Indians in a positive way. An exception to this was a new musical medium. So far as we know, ancient America lacked stringed instruments. It was early invaders who introduced the *vihuela* and *bandurria,* archaic forms of the guitar and mandolin respectively. By 1600 the Indians had adapted these to form the charango de kirkinchu—a miniature instrument usually with five pairs of strings and an armadillo shell for a sound chamber.

The Jesuits entered Peru in 1568. Many hailed from Ireland, bringing with them the Celtic harp. Out of this, the Indians created the most magnificent of instruments, and with it they lifted their ancient music to new levels of subtlety and complexity, equal to any other classical tradition in the world. Radically enlarging the sound-box, they produced an instrument that combines the features of harp and double bass. It allowed a single performer to play the subtly articulated independent bass and treble lines so characteristic of Andean music. In competent hands, it is hard to believe one is hearing a single instrument and player. To quote the d'Harcourts:

> *The Indian, endowed with such a lively musical imagination, succeeds in combining with these (melodies) other often completely different rhythms which he expresses on the harp, percussion instruments, or by clapping of the hands. The cadences that result are at once remarkable, vigorous and subtle.*[18]

So much for voluntary acculturation. Spanish authorities were less successful in their repeated attempts to "civilize" (hispanicize) the natives. In 1613 the archbishop of Lima ordered Indians to be taught devotional songs. At the same time, he outlawed the playing of *tinyas,* dancing and singing in the old way and the revival of "heathen" dances and songs in Quechua.[19] The Spaniards, no doubt, remembered well

HARPIST Santiago Mamani Quispe accompanied by his wife and son for Radio Tawantinsuyu broadcast in Cuzco. (Photo by Author)

the *Taki Onqoy* crisis/cult in which music and dance played a major role.

In the late 1560's, an uprising was planned to coincide with an expected celestial victory of the old gods over the Christians. Indian cultists believed that the ancient order would be restored if they fervently worshipped the shattered remnants of their shrines and "idols" destroyed by the friars. Dancers performed ecstatic rites, became "possessed" by ancient deities and uttered prophecies. *Taki Onqoy,* Quechua for "sickness dance," suggests the cult took inspiration from the apocalyptic horror that broke loose in Tawantinsuyu during massive smallpox plagues that decimated the population. While the movement greatly alarmed the Spaniards, it was really the pathetic cry of a people in desperation, and had much in common with other crisis cults such as early Christianity and the Ghost Dance Religion that gripped North American tribes.

Attempts to stamp out Indian culture clashed with constant reaffirmations of native identity in pageants, plays and composition, often performed in secret. Up until the disastrous Tupac Amaru uprising of the late 18th century there existed an Indian upper class descended from officials and aristocrats of Tawantinsuyu. Efforts to Hispanicize this group succeeded fairly well at first. To judge from Waman Puma's drawings, most Inca aristocrats *circa* 1600 wore Spanish dress and cultivated the Iberian pastimes of horsemanship, gambling and wine drinking. But these affectations were, for the most part, superficial and may even have been deliberately practiced to lull the conqueror. Puma himself usually dressed like a Spaniard, but his *Nueva Cronica* is profoundly subversive and nativistic.

Puma, while describing the lighter side of the life led by the native aristocracy, gives us some insights into their hybrid culture. In his delightful drawing entitled *"Indios Criollos e Indias Criollas"* [20] an Indian in Spanish costume serenades a lady in Inca dress, save for her frilly sleeves, keys and jewelry. The man plays a *vihuela* and sings the following song in Quechua:

Chipchi llantu,	Glittering shade,
Chipchi llantu,	Filtered light,
Paqay llantu.	Shade of the *paqay* tree.
Maypin, kaypi rosastika,	Oh where? Here are the roses!
Maypin, kaypi	Where? Here are the yellow
chiwanwaylla,	*chiwanwa* flowers
Maypin, kaypi	And where? Here the white
Hamankaylla.	*hamankay* lillies!

Like the *kyanakuna* and *aqllakuna* of Inca days, Indian children were inducted into religious service. The offspring of the former ruling class served the imported gods and as junior monastics and lay priests they learned—and created—the church music of the day, a mixture of Indian and European devotional tunes with words mostly in Quechua. Evangelization was a two-way street, as any Catholic visitor to Peru can see, and Andean Christianity came to embody and preserve much of the old pre-Conquest religion.

Qanmi Dios kanki,	You are God,
Yuraq hostia santa,	The white sacred host;
Qonqor sayaspam,	Waiting on our knees,

Chunka muchaykuyki,	We worship you tenfold,
Uyarillaway,	Hear us,
Apu Jesu-Cristo,	Lord Jesus Christ,
Dios wakcha kuyaq.	God, lover of the poor.[21]

In this hymn Christ has been given the Quechua title *apu,* a term for both Inca lords and holy mountain tops (and still is today). God is called *wakcha kuyaq,* another title of the Inca ruler which means, "he who cares for those without kin."

As colonial rule became more onerous, Spanish culture lost prestige in Indian eyes. Old Tawantinsuyu assumed the proportions of a golden age—a picture of the past fueled by the circulation of Garcilaso's *Comentarios Reales* among native aristocrats. His utopian vision of the Inca Empire, which he compared to the Romans, led to the conviction that both had succumbed to barbarian invasions, a conclusion supported by the magnificent aqueducts, roads and terraces lying everywhere in ruin. Portraits of Inca nobles from 18th century Cuzco show a return to native dress and customs. Revivals of ancient folklore such as the Quechua drama *Ollantay* (heavily re-written from older material by Valdez, a priest with Inca sympathies) and the staging of Conquest plays lamenting the fall of the old regime became more common.

The glorification of ancient traditions caused alarm. Some Spanish authorities in Lima saw them as politically subversive and religiously unsound.

There was good reason to fear.

In 1748 the Indian *curacas* (nobles) of Lima staged an elaborate pageant and play to "celebrate" the coronation of King Ferdinand VI. The portrayal of Atauwallpa's treacherous death reportedly moved many Indians to tears. Two years later, a priest violating the secrecy of the confessional revealed an Inca plot to overthrow the Spanish in a palace coup. Twelve Inca *curacas* were rounded up; six hanged.[22]

A generation after this, Visitador Areche showed that he did not underestimate the role of music. In recommendations to crush the Tupac Amaru revolt he advised:

> *". . .Indians should not be allowed to represent in any of their towns and provinces comedies or other public functions which they use to preserve the memory of their ancient Incas . . and the trumpets and horns which the Indians use in their functions should be forbidden and taken away. . .those (trumpets) that are called* ***pututos*** *and are marine shells with a strange and mournful sound with which they evoke the sorrow and painful memory of their past and the day of the Conquest which they hold in dread. . ."*[23]

Tupac Amaru's revolt cut short the 18th century Andean renaissance. Massacre and deportation depleted the ranks of the native aristocracy. There followed attempts to suppress indigenous names, dress, music and language. Areche's efforts to obliterate the Inca heritage succeeded at the political level, but his naive program of acculturation (he proposed among other things, that all Indians be taught good Castillian within four years) met with that stolid wall of resistance that has been the bane of Peruvian governments ever since and an effective wall against fierce but erratic outbursts of Iberian zealotry.

With the downfall of the Indian intellectual elite, music lost its national identity, becoming simply a folk tradition preserved among a peasantry deprived of indigenous models for cultural growth.

Fortunately, we have a window on the music of this period through the work of Martinez de Companon.[24] In the 1790's this bishop and pioneer ethnomusicologist travelled across northern Peru from the coast to selva. The most significant pieces come from Trujillo, Lambayeque, Otusco, Cajamarca and Chachapoyas. On the coast he found Afro-Latin pieces and some heavily acculturated "Chimu" songs in the now-extinct Muchic tongue. In the selva beyond Chachapoyas, Spanish influence is again strong. In the Andes, tunes show pentatonic melodies and duple metre, words in mixed Quechua and Spanish and the use of violin accompaniment. This collection, small though it is, shows much the same character and distribution of folk music found in Peru today. Enough tunes survive from the late 18th century (including the famous *El Condor Pasa)* to show that Andean music remained remarkably static until the second half of this century when the impact of modern media and renewed interest by educated non-Indians accelerated the process of change.

Andean music has often been characterised as sad, melancholy, evocative of the tragedy and the harshness of sierra life. Indeed, the d'Harcourts give support to this romantic view by tracing the development of the *harawi* during the Colonial period:[25] In 1608, Gonzalez Holguin, the great lexicographer of the Quechua language, gave the following definition of *harawi:*

> *"Songs of the deeds of others, or in memory of absent lovers, or of love and affection. . .(also) used for spiritual and devotional chants."*[26]

Cobo added:

> *"Those songs which were of happiness and joy they called* ***arabis (harawis);*** *in these they related their deeds and ancient things, and they sung paeans to the Inca."*[27]

Harawi was, thus, a general term for many kinds of song, but during the Colonial era it acquired the exclusively solemn, doleful character it has today.

The reasons for this transformation are not hard to imagine. In the century following the Conquest, at least 80% of Tawantinsuyu's population perished. Survivors witnessed the shattering of their world: funeral dirges must have been far more common than "songs of happiness and joy." In perhaps his most poignant drawing, Waman Puma gives us an *extempore harawi* sung by the crowd at the death of young Inca Tupac Amaru I in 1572. Below the grisly execution scene a row of bareheaded Inca women and men, tears streaming down their faces, cry out:

Inca Wanakauri	Inca Wanakauri
Maytam rinki?	Where are you going?
Sapra auqanchikchu,	Our wicked enemies,
Mana huchayoqta,	Without retribution,
Kunkaykita kuchun	Are cutting you neck.[28]

By addressing Tupac Amaru as Wanakauri, the mourners lament the passing of the entire Inca dynasty in his person, for Wanakauri was a stone believed to be a

petrified ancestor of the ruling Inca *ayllus*.

The Inca royal family was not entirely extinguished on this occasion. A daughter of Tupac Amaru I survived to marry Felipe Condorcanqui, *curaca* of Tinta. (His name *Kuntur Kanki*,"You are the Condor," itself connotes royalty.) The great, great grandson of this marriage revived his family's ancient title as Tupac Amaru II in the last great convulsion of the Indian nation. A *harawi* composed at the time of his death in 1781 became the best known of all Peruvian tunes—*El Condor Pasa*. Curiously, the only words I have been able to find are in Spanish (Simon & Garfunkel's English lyrics are their own creation). The passing of the condor represents the death (yet continued life in the form of the totemic bird) of Inca Tupac Amaru Condorcanqui:

Tu canto llega con amor,	Your song reaches us with love,
Condor, condor;	Condor, condor;
Tu llanto gime con dolor,	Your cry trembles with pain,
Condor, condor;	Condor, condor;
Tu simbolizas libertad,	You symbolize freedom,

MOURNERS AT the grisly execution of the young Inca Tupac Amaru I in 1572. With tears streaming down their faces, they sing the harawi translated on page 8.

Condor, condor;	Condor, condor;
Errante siempre tu seras,	You will always be wandering,
Condor, condor;	Condor, condor;
El tambien,	So will he,
Yo tambien,	So will I,
Tu tambien,	So will you,
Condor, condor.	Condor, condor.[29]

Nowadays, the livelier *wayno* is far more common than the *harawi*.It is tempting to see in this a reflection of the improved condition of Andean people. Battery-powered radios and record players have spurred the growth of a now thriving 45rpm record industry catering to the rural market. *Wayno* "hits" emanate from Huaraz, Huancayo and Cuzco in much the same way that Country & Western diffuses from Nashville, Tennessee. Inevitably, commercialization has brought changes; most noticeable is the virtual disappearance of flutes in favour of accordians and harmonicas. Saxophones and clarinets are also very popular in Huancayo, where many curious juxtapositions of ancient and modern have come about due to the railway link with Lima. Quechua lyrics still dominate in the southern Andes, but Spanish is fast taking over in Huaraz and Huancayo. These modern trends are, of course, strongest among professional bands. Unsophisticated "live" music in villages, with words in Quechua or Aymara, continues to depend on traditional wind instruments.

As mentioned above, the word *wayno* is of Aymara origin (waynu) and seems to have displaced the Quechua term *Kashwa*. Cobo describes the kashwa dance as "...a wheel or ring of men and women holding hands and dancing going around..."[30] In another kind of *kashwa*, couples dance in pastures near burial grounds on nights of the spring moon. Rapid foot tapping, called t'aqtay in Quechua and *zapateo* in Spanish, is typical of this dance. Nocturnal dancing in pastures perhaps led to the custom now known as *vida michi*, during which adolescents hold clandestine drinking parties to *wayno* music that result in their first sexual experiences. (The association of sex and cemeteries—a reaffirmation of the life cycle—will surprise no one who has seen the priapic skeletons on ancient Mochica pots.)

Waynos often have somewhat risque or tragi-comic lyrics. Witness this song from Ayacucho:

Utuskuruscha	The Caterpillar
Utuskuruscha presulla hamuchkan	The caterpillar is going to jail
Habascha sisachallan chutaykusqanmanta,	For taking the young bean flowers,
Llullu habaschata chiptiykusqanmanta.	Because he's been munching the tender unripe beans.
Chaynama noqapas presulla richkani	I, too, am going to prison
Doncella warmachata chutaykusqaymanta.	For taking an innocent young girl.
Ama hina kaychu yanapaykullaway!	Please, help me!
Kurria willaykamunki abugadullayta.	Run and tell my lawyer.
Estribillo:	Refrain:
Iskinapi sayakuskaqtan,	While I was waiting at the corner,
Guardia Civil aparqwan,	The police took me away,

"Qanmi kanki kulpable,"	Saying, "You're the one to
nispa,	blame,"
Justiciaman churaykuwan.	They brought me to court.[32]

Most *waynos* are in duple metre, usually 2/4 time. A binary structure occurs throughout, with lines and verses repeated twice. The refrain is sung somewhat more quickly — a pattern which parallels the common practice of appending a *wayno* "fugue" to the slower *harawi.* The d'Harcourts couldn't decide whether the origin of these *fugas* (not to be taken as fugues in the strict Classical sense) was indigenous or Colonial. It is likely a blending of analogous forms from both cultures. Many Andean tunes increase in tempo towards the end, and this is just as true for simple pipe music from isolated areas as for more acculturated material.

A characteristic of *wayno* singing, whether in Quechua, Aymara or Spanish, is the accenting of syllables normally unstressed. The vocal line, thus, adheres strictly to the cadence of the melody. Such distortions of speaking rhythm do not occur in Hispanic *criollo* singing, where several voices typically maintain romantic, sentimental harmonies quite different from the bold stridency of the *wayno.* "Andean" music produced nowadays by non-Indian groups, such as the Chilean *Inti Illimani* or Bolivian *Savia Andina,* often play fairly traditional instrumental parts with charango and siku, but they never attempt the authentic Indian style of singing.

The present popularity of "native" music among members of *criollo* society is certainly a switch from the scornful attitude of the past that was once so common among Peruvians and Bolivians from privileged urban backgrounds. In Peru, Quechua has been made the second official language, and the government has stressed Andean cultural programs on national radio and television. Unfortunately, there are now signs that these changes may be short lived.

Meanwhile, in the hinterland, the heirs of Tawantinsuyu continue to celebrate the seasons with *tinya* and *pinkullu.* And on the most solemn occasions conch trumpets pierce the thin air of the Andes with their uncanny sound, as they have for the last three thousand years.

Notes

1. John Hemming, *The Conquest of the Incas* (London: MacMillan, 1970), p.25

2. Ruiz's account appears in Gonzalo Fernandez de Oviedo, *La Historia General y Natural de las Indias* (Madrid: Real Academia de la Historia, 1855) IV, p. 122 (First pub. Seville, 1535)

3. Diego Gonzalez Holguin, *Vocabulario de la Lengua General de Todo el Perú* Lima: Francisco del Canto, 1608) cited in Robert Stevenson, *Music in Aztec & Inca Territory* (Berkeley: U. of California Press, 1968) p. 294, note #4.

4. R. et M. d'Harcourt, *La Musique des Incas et ses Survivances* (Paris: Geuthner, 1925) pp. 156-7.

5. Garcilaso de la Vega, El Inca, *Royal Commentaries of the Incas* (Austin: U. of Texas Press, 1966), pt. I, p.127 (first pub. Lisbon, 1609). My translation of song.

I have written all the Quechua songs and words in this paper using the orthography of the official aophabet promulgated by the Peruvian government in 1975. There are some minor regional variations, and archaic words that are doubtful have been left in traditional spelling (e.g. *Inca — Inka? Inqa? Ink's?).*

6. Garcilaso, pt. 1, p. 245.

7. Collected by Peruvian folklorist J.M.B. Farfan, cited in Arguedas & Stephan, *The Singing Mountaineers* (Austin: U. of Texas Press, 1957), p. 9 My translation.

8. Waman Puma (Guaman or Huaman Poma de Ayala), *El Primer Nueva Cronica y Buen Gobierno* (Paris: Institut d'Ethnologie, 1936), p. 314. Also published in transcript edition (La Paz: Instituto Tihuanacu, 1944). Written between 1585 and 1615.

9. Garcilaso, pt. 1, p. 125

10. Waman Puma, pp. 318-320. My translation.

11. Waman Puma, pp. 300, 314.

12. Garcilaso, pt. 1, p. 125.

13. Robert Stevenson, *Music in Aztec & Inca Territory* (Berkeley: U. of California Press, 1968), pp. 246-7.

14. Waman Puma, pp. 315-329 and 237-250.

15. *Popol Vuh, The Sacred Book of the Ancient Quiche Maya* Trans. Recinos, Goetz, Morley, (Norman: U. of Oklahoma Press, 1950).

16. Brock Cutting, personal communication, 1981.

17. A possible exception to this is the musical bow found in Amazonia and Patagonia. There is evidence that the instrument may have been introduced by African slaves in the 16th century. See: K. G. Izikowitz, *Musical and Other Sound Instruments of the South American Indians* (Goteborg: Aktiebolag, 1934. Republished Wakefield: S.R. Publishers, 1970), pp. 201-206.

18. d'Harcourts, p. 161.

19. *Constituciones Synodales del Arcobispado de Los Reyes* reprinted in *Constituciones Synoldales* (Lima: Ignacio de Luna, 1722), cited in Stevenson, p. 263, note #42.

20. Waman Puma, p. 856. Thanks to Toribia Chavez for translation.

21. d'Harcourts, pp. 246-7, song #9, from Huanta, Dept. of Ayacucho. My translation.

22. John Rowe, "El Movimiento Nacional Inca del Siglo XVIII" in *Tupac Amaru II-1780,* ed. Alberto Flores Galindo (Lima: Retablo de Papel, 1976), p. 45.

23. John Rowe, *Ibid.,* pp. 35-6, My translation.

24. Stevenson, pp. 313-321.

25. d'Harcourts, pp. 172-175.

26. Holguin, I, 145, cited in Stevenson, p. 262, note #37. My translation.

27. P. Bernabe Cobo, *Historia del Nuevo Mundo* (Seville: Jimenez de la Espada, 1890-95), tomo IV, libro IIV, ch.XVII, cited in D'Harcourts, p. 171, note #3, My translation.

28. Waman Puma, p. 451. My translation.

29. Julio Benavente Diaz, *Charango I Quena* Cuzco: Editorial de Cultura Andina, 1976), p. 89. My translation.

30. Cobo, tomo IV, libro XIV, ch. XVII, cited in d'Harcourts, p. 175. My translation.

31. For a description of the *Vida Michi* and some of the songs see: Fredy Amilar Roncalla, "Chuschi: Las Canciones y la Vida," *Runa,* No. 1 (Lima: Instituto Nacional de Cultura, March 1977), pp. 8,9.

32. I am grateful to Antonio Sulca and Miguel Angel Sulca of Ayacucho for providing the text of this *wayno* with a translation in Spanish. My English translation. Personal communication, 1981.

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Waman Puma. (Guaman or Huaman Poma de Ayala) *Primer Nueva Coronica I Buen Gobierno (sic).* Paris: Institut d'Ethnologie, 1936. Transcript edition, La Paz: Institute Tihuanacu, 1944.

Recordings of Andean Music

This list is by no means exhaustive, and it deliberately excludes well known commercial studio productions of non-Indian musicians such as *Urubamba, Inti Illimani,* Raymond Thevenot, *Los Incas, Los Calchakis, Sukay,* etc., though some of these are relatively faithful to their material. The following examples were all recorded by itinerant musicologists or local recording companies.

Barclay (Paris) *Indios del Sol* (#40044)

Recorded in late 1960's at Cuzco's *Inti Raymi* festival and at the Oruro carnival, Bolivia. Some excellent examples of female vocal in the high-pitched Cuzco style.

Crawford, Neelon (New York) *Soul Vine Shaman*

Music and chants of an *ayahuasca* shaman recorded on the RioNapo, Ecuador, 1976. Examples of violin being used in the manner of a musical bow for "spirit catching." Good ethnographic notes.

Folkways (New York) *Mountain Music of Perú* # FE 4539

Double album anthology with a spectrum of material ranging from unsophisticated ritual music to 45 rpm *wayno* hits. Recorded 1964. Good booklet of notes.

Music of Perú (FE 4415

Recorded in Lake Titicaca area by Harry Tschopik in 1949. Sound quality poor, but material valuable.

IEMPSA (Lima) *Cumbres Nevadas: Sumac Sayhua* (ELD 0206182)

Rural Indian band from Cuzco area featuring *kena, tinya,* violin, mandolin and female singer. Authentic style, Auechua lyrics.

INFOPESA (Lima) *Tristeza del Indio* LPS 8021)

Professional renditions of traditional tunes from southern Andes played on *kena,* guitar and *charango.*

Lyrichord (New York) *Perú: Music from the Land of Machu Picchu* LLST 7294)

Interesting Anthology collected in 1975. Includes fine example of Huancayo fiesta music featuring harp, violin, clarinet and tenor saxaphone.

Music of the Incas: Ayllu Sulca (LLST 7348)

Ayacucho harp of Antonio Sulca, and music of his band "Ayllu Sulca" featuring harp, violin, mandolin, *kena* and tinya. Recorded by myself in 1980.

Laments and Dances of the Tawntinsuyu: the Inca Harp

Album to be published fall 1981. Will feature two solo harpists from Cusco and more of Antonio Sulca's harp.

Nonesuch (New York) *Kingdom of the Sun* H 72029)

Good anthology including stringed music of Ayacucho and pan-pipes of Lake Titicaca. Sadly, names of performers are not acknowledged.

Fiestas of Perú (H 72045)

Similar to above, but includes music of Paucartambo fiesta.

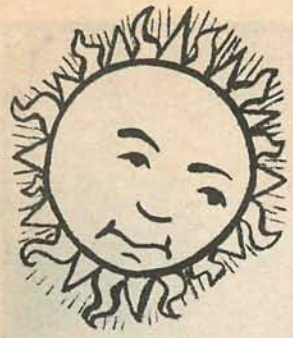
Volcan (Cusco) *Soltera Suhuay* (DLPS 147)

Female singer in traditional style of Sicuani region with mandolin accompaniment.

Vale un Perú (DLPS 152)

Typical band of the Urubamba valley with female singer, harp and harmonica. Customary interjections in Quechua and Spanish by Cusco radio host Mario Molina, "El Waylaychu".

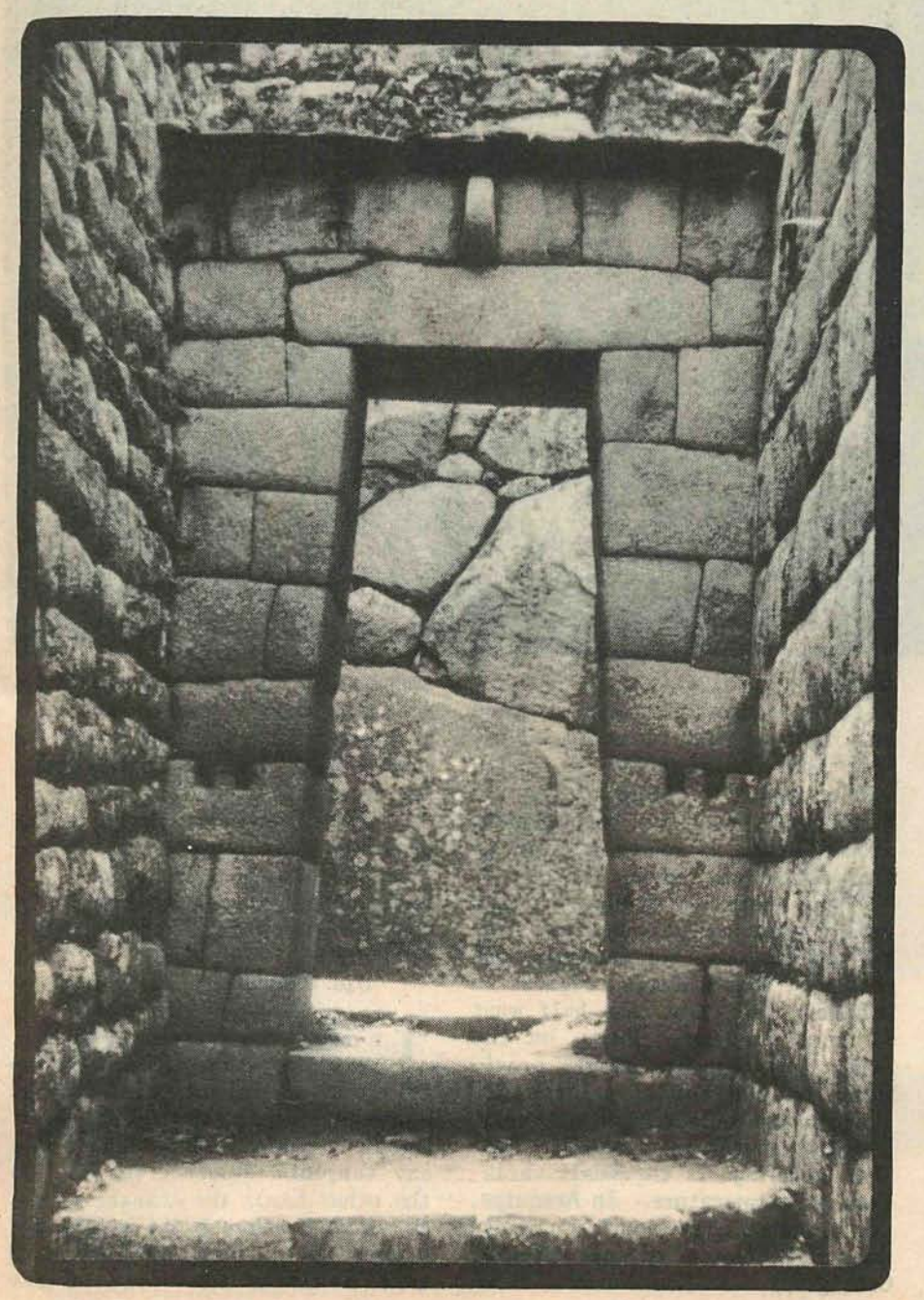
A word of warning: Recently there have appeared some albums of Paraguayan harp masquerading as Peruvian. One I saw is by a band called *Los Peruvianos (sic!).* Another is called *Harp of the Andes.* I cannot understand the need for this deception.



By Hugh Pierson

PHOTOGRAPHS BY AUTHOR

SOLAR SOLUTION



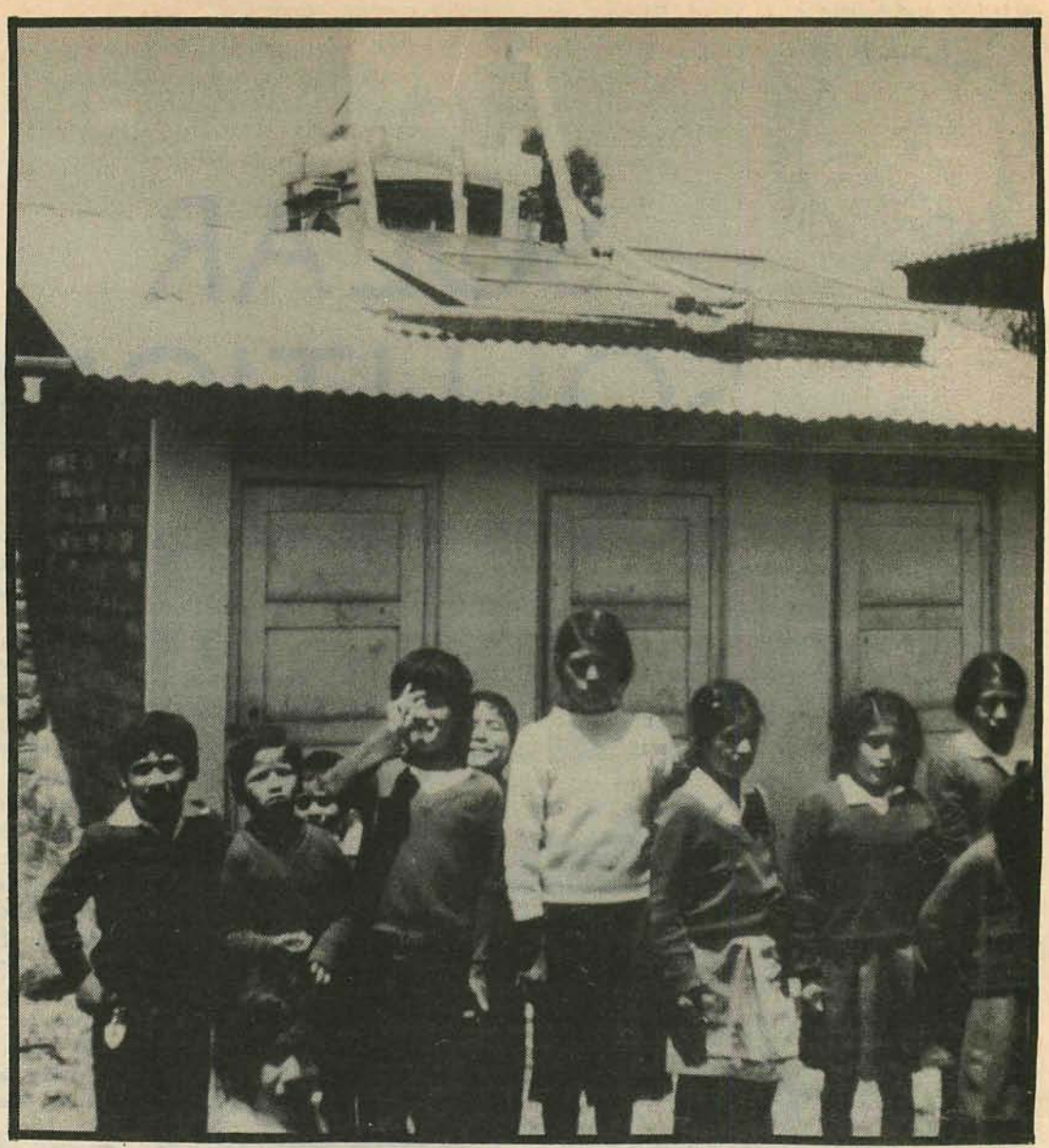
The 24th of June is the night of San Juan, and in the Andes it is usually the coldest night of the year. It is, also, the feast of the Sun God, (Inti Raymi) when, we are told, the Inca welcomed his father the sun, rising from behind Mount Auzangate far away on the eastern skyline. Even today, it is colorful and joyful, with songs, dances and much drinking of the sacred chicha.

We are told of Inti, the sun, rising from Lake Titicaca after the primeval flood to assume his supreme lordship in the hierarchy of the Inca heaven. Inti fathered the first Inca, the mythical Manco Capac, to assure his dominion over the earth and in the heavens. His earthly abode was Cuzco, then the Mecca, the Jerusalem, the Rome of the Inca empire. There, in the Temple of Coricancha, mamaconas, the sacred women of the sun, constantly attended his image, an enormous casting of solid gold.

Inti was an all powerful deity, the holy presence in the Coricancha. He was also very real, providing daily life and warmth. Throughout the Andes the nights are cold year round. How great is the pleasure when the first rays of sun peak over a nevado. Inti may be mythical, but not the power of the Andean sun.

Over the remains of the Coricancha rises Santo Domingo Church. Inti has lost much of his divinity. One sun in a minor galaxy, he is one among billions of other

Hugh Pierson is on the technical staff of Sandia National Laboratories in New Mexico. In 1980, he studied solar energy for 5 months on a Fulbright Scholarship.



A SOLAR roof collector used to heat water for the school shower in the small Andean village of Huayao.

Intis. We know that the sun is a gigantic hydrogen bomb. As it continuously fuses hydrogen atoms into heavier elements, it unleashes enormous amounts of energy. Only a small fraction of this energy reaches the earth. We see it as sunlight. But the visible band of light is merely a portion of the total spectrum which includes both invisible infrared and ultra violet rays.

What becomes of this energy? A great deal is absorbed by our atmosphere, including almost all the lethal ultra violet. What is left is considerable. Huancay, a typical Andean town, receives 25 megajoules/m2 per day. This means that in the course of a day the energy in the sunlight striking one square meter is enough to boil 60 liters of water. Most of the Andes receive as much or more, with Arequipa in southern Peru holding some kind of world record. The thin coastal strip, with its winter cover of clouds, is not so generously endowed, particularly around Lima, as every visitor to the capital city knows.

In high latitudes, solar energy varies greatly between winter and summer. For instance, the northern United States receives in December less than than half what it does in June. Perú, on the other hand, because of its proximity to the equator, receives roughly the same amount all year, a great advantage, indeed. Another advantage is the small variation in temperature. In Arequipa, for instance, the monthly average does not change by more than 2° Centigrade. In New Mexico, fluctuations of 35° are common. Perú, in other words, has the ideal geography for utilizing solar energy. With such potential, what has been done? What can be done?

The Incas mastered urban planning, developed stone architecture to a perfection yet unequaled and engineered truly awesome works of terracing and irrigation.

Did they use solar energy?

In tramping up and down the trails of Cuzco, on the Camino del Inca, in remote ruins such as Phuyupatamarca, Huinay Huayna or Machu Picchu, I have yet to see any tangible evidence of it. On the other hand, the Anasazi of the American Southwest skillfully designed their cliff dwellings to take maximum advantage of the

winter sun. The cliffs of Mesa Verde in Colorado or Chaco Canyon in New Mexico, can be among the coldest places on earth during a winter blizzard, colder than the coldest night in Cuzco. Perhaps, then, the Incas never felt the need to develop solar energy. Yet, at higher altitudes it is cold, cold in June, cold in January, cold all year. At the mining camp of Morococha, at 4500 m, the average temperature inside a building is 8°C. Survival demands two sweaters, a hat and a spot near the stove.

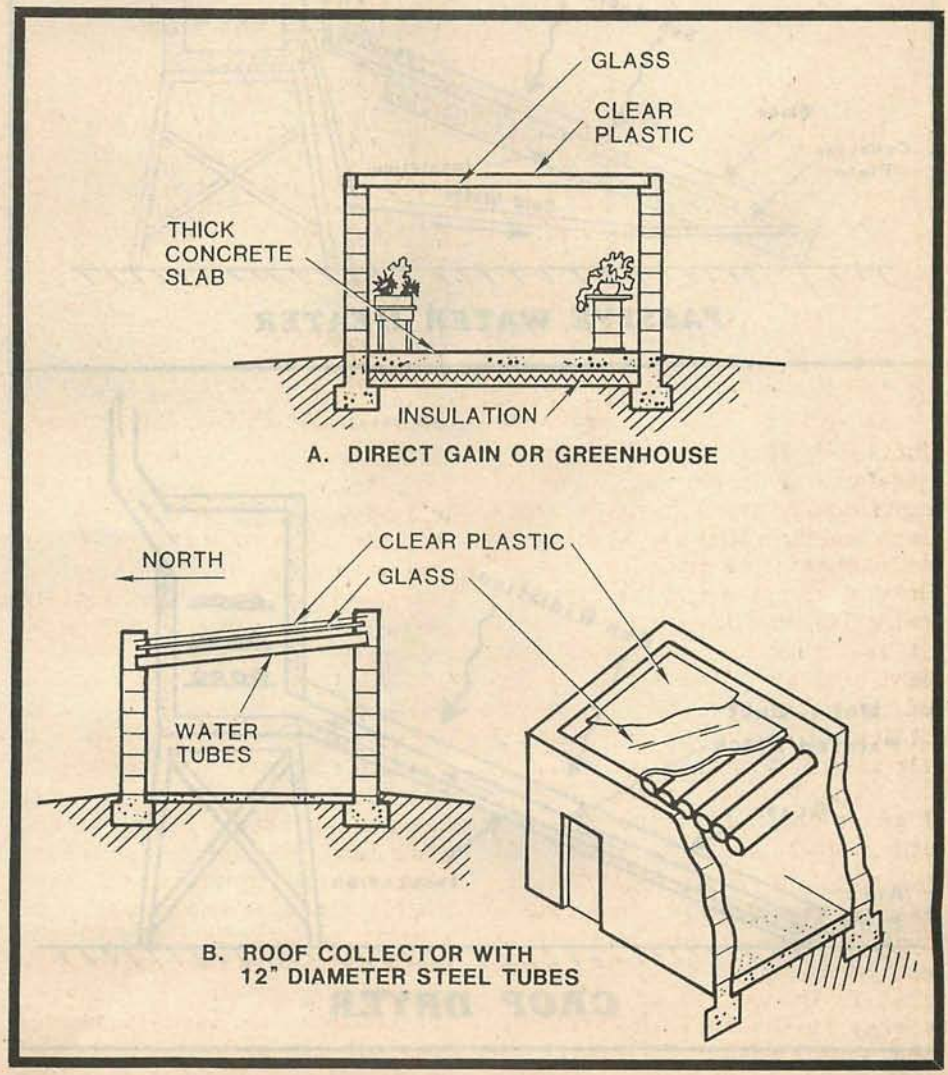
Yet even here, with no advanced technology, no fancy gadgets, no controls, no fans, no motors — one could be warm by simply using the proper architectural design.

Take, for example, a solar house in New Mexico — a long way from Perú, but it's the same principle anywhere on earth. In winter, the sun is low and shines into the house through large windows facing south with all the intensity found in the high mountains of the Southern Rockies. It is cold outside, often bitter cold, with temperatures dropping to -20°C or lower. It is snug inside. A dark floor absorbs solar radiation by day, giving heat back to the room at night. Massive adobe walls further stabilize the temperature. Should the sun not shine for a day or two, a small wood stove provides the only needed additional source of heat. A solar greenhouse, attached to the south side, gathers heat during the day which is released at night to grow vegetables and flowers almost all year round.

It's the same solar energy in Perú as in New Mexico, but with a difference. Nearer the equator, the sun is always high in the sky, at least at noon. Windows facing North would be in the shade during the Peruvian summer, from November to February. Therefore, one way to tap this energy is to allow sunlight to enter the roof through glass or, preferably, clear fiberglass panels. Another approach is to install on the roof a series of steel tubes, painted black and filled with water, forming a large thermal mass to absorb heat during the day for release inside at night (Fig. 1). Both systems are under study at ITINEC, a division of the Ministry of Industries in Lima, in cooperation with Centromin, the large government mining concern.

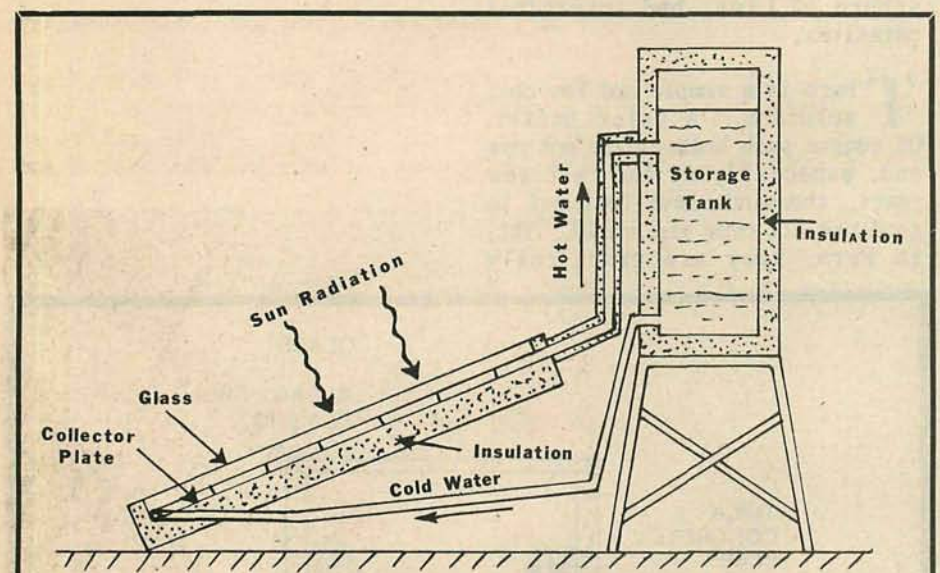
Hot water is a rare and expensive luxury in the Andes. Very few homes have a terma, the electric heater ubiquitous in other parts of Peru. When faced with taking a very cold bath or shower, many stay unwashed. So do dishes, pots and pans. Grease and dirt accumulate, contributing to the general poor state of health. A recent study showed that over 60% of the school children in Rimac, a suburb of Lima, had intestinal parasites.

There is a simple and low cost solution. A solar heater. Of course such heaters are not new and, especially in the last few years, thousands have been put to good use all over the world. Yet, in Perú, they are practically

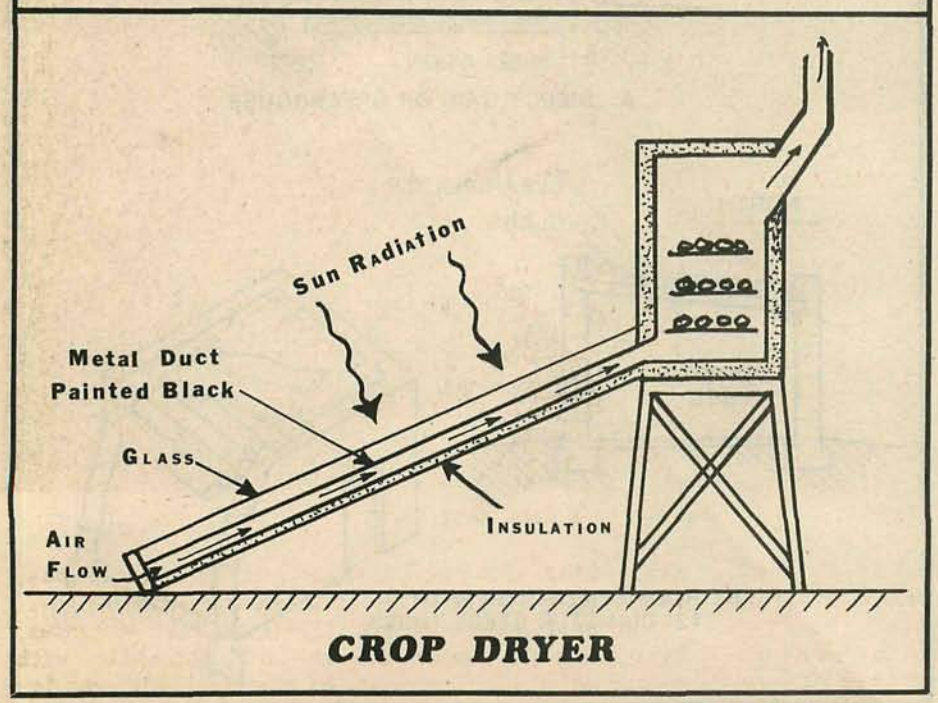


unknown, in spite of the pioneering efforts of ITINIEC and several Peruvian universities.

ITINIEC produced an excellent design, and several units are in operation (Fig. 2). I saw one in Huayao, a small Indian community near Huancayo. Entering the schoolyard, I was quickly surrounded by a sea of young, brown faces — laughing, talking or looking shyly at the gringo. The school principal proudly showed me the installation, with roof collector and a room were four or five little boys were taking a shower together amidst peals of laughter.



PASSIVE WATER HEATER



CROP DRYER

On weekends, the people of the community use it, too. It is undoubtedly one of the most occupied showers in the world. It works beautifully and has worked, without a hitch, for the past three years.

Arequipa is the wool center of Perú with several large processing plants for alpaca and sheep wool. Wool must be cleaned with soap and hot water. The cost is considerable, requiring enormous quantities of diesel fuel to heat the water. A program is now underway at the Empresa Mitchell, a very large and progressive company, to switch to solar heating. It is estimated that the conversion will pay for itself in three years. Other commercial establishments such as breweries, hotels, restaurants, etc., could benefit as well.

In a little village near Ayacucho, I saw a group of campesinos standing quietly around a large white box connected to a slanting sheet of black steel covered with glass. I sampled the dried peaches taken from inside. Delicious.

Fruits left to dry directly in the sun are prone to insect damage. Often blackened by the sun, they can also be contaminated by dust and dirt, or totally ruined by a sudden downpour. A solar dryer does away with such problems. This particular unit is an ITINIEC design (Fig. 3).

In the fat days of the Incas, Perú, with a larger population than it has today, accumulated food surpluses. Those days are long gone. Imported food accounts for Perú's economic imbalance. Poor communication and transport often result in enormous losses, particularly in the jungle. There, major crops, such as corn, rice and yuca, are at the mercy of the elements. Industrial drying is nonexistent — the technology is not there and the cost of fuel too exorbitant. That leaves solar drying. Designs and techniques are not new.

In Australia, solar drying is used on a very large scale. As fuel prices soar, it is gaining serious considered in the United States. Solar energy may very well be Perú's great untapped resource. ■

OILBIRDS

By Roman Kyshakevych

PHOTOS BY D.L. GOLOBITSH

There have been several studies of Steatornis caripensis (guacharo, guapaco, oilbird) since its discovery and classification in 1799 by the German naturalist Humboldt at Caripe Cave (Cueva de Caripe), Monaga, Venezuela.

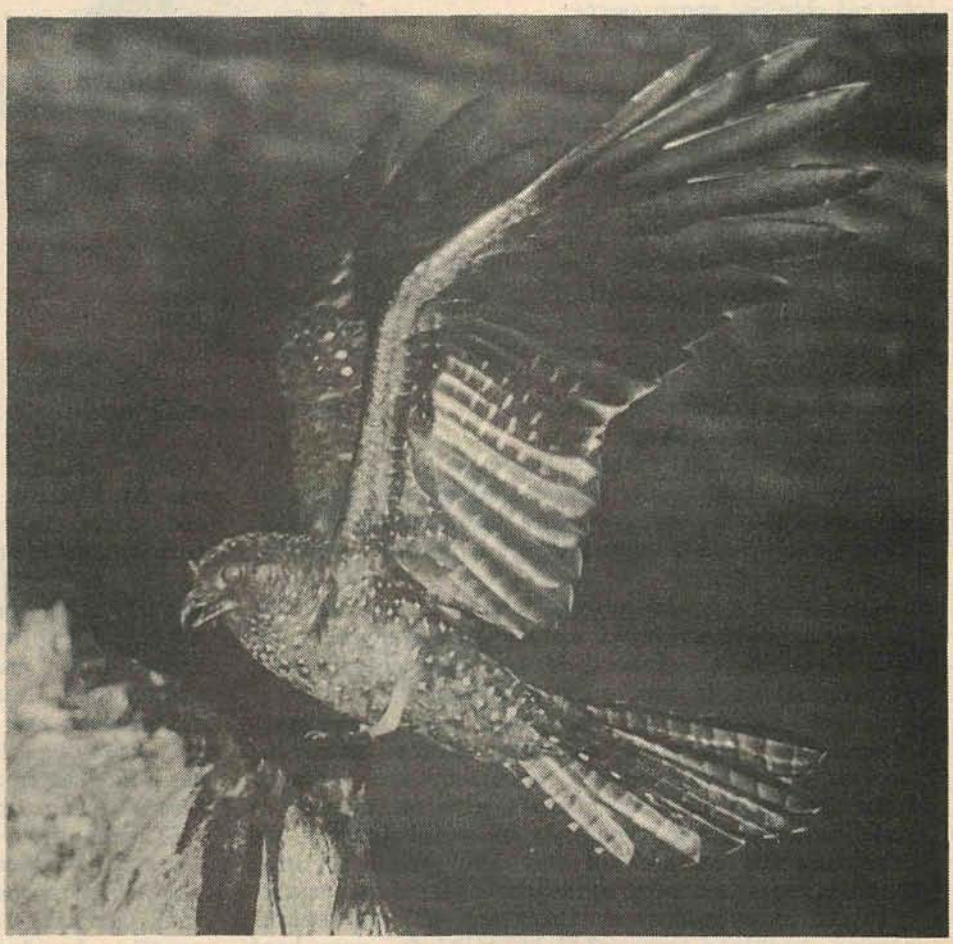
Of these, the most detailed on oilbird ecology were carried out by E. de B. Pietri (1957) and D. W. Snow (1957-1961), in Caripe and Trinidad respectively.

Griffin (1953) at Caripe Cave focused on the peculiar capacity of the oilbird for orienting itself in complete darkness. Nevertheless, aside from some observations made by Stolzman in Perú (1880) and a few others, very little is known about Andean oilbirds.

In the last decade, the Institute of Natural Renewable Resources (INDERENA) created a new national park called 'Cueva de los Guacharos.' Shortly thereafter, the Institute decided to investigate this intriguing species with an eye to assuring its survival.

The study began in November 1972 and ended June 1973, months chosen to coincide with the reproductive period of the oilbird. This study deals with the following: species description, population, social structure and habitat, reproduction and feeding.

Visits to the cave to collect data totaled 350 hours, during which time we explored the cave collecting data on nests, their contents, taking a census of oilbirds, gathering samples of seeds and fruit, and making notes on oilbird behavior.



OILBIRD — The cave-dwelling bird that lives like a bat.

To observe life within the cave, we put red plastic over our flashlights. (Birds don't react as much to red light as they do to white.) We also wore miners' carbide lamps. The beam is dispersed and frightens the birds less. Also, this way we could listen closely in the dark to a particular bird and only occasionally use the light to verify it's location.

To examine the oilbird's diet, we set up large plastic trays (1 X 15 meters) under the largest grouping of nests in the cave. Periodically, we gathered the droppings for weighing and counted and classified the various types of insects, seeds, fruit, eggs, small birds, etc. in the guano.

We used Snow's method (1961) to take a census, estimating the number of birds in flight while, with a hand calculator, we counted perched birds, and totaled the two. Photos of birds grouped and nesting

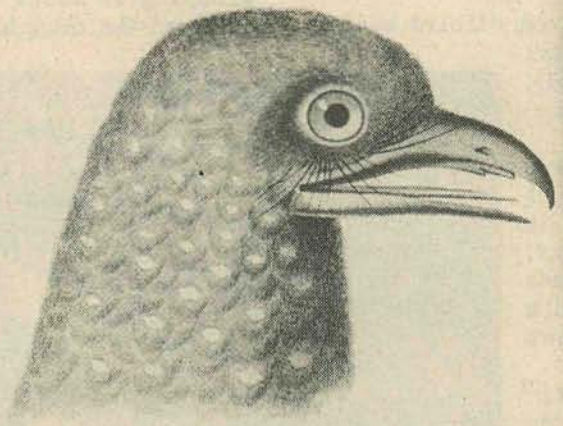
on the walls helped us to further calculate colony populations.

Guacharos Cave National Park is located high up the Río Suaza, a tributary of the upper Río Magdalena, on the west slope of the Cordillera Oriental. It lies in the extreme south-southeastern section of the Department of Huila at an elevation varying between 1,800m and more than 3,000m. The cave is approximately 1,850 meters above sea level.

Near the cave, the climate is isothermic with an average temperature of 18°C. Although summer and winter are not well defined, the heaviest rains fall between February and July. Just outside the park, colonists have leveled large forest areas with fire and axe. This protected area is one of the last stretches of high jungle once marking the boundary of the upper Río Magdalena Valley in southern Huila. Many animals seek shelter amongst the plentiful plant life of the park. Heavy rainfall and dense misting clouds support a rich plant life.

The Suaza River is the architect of the Guacharos Cave. In addition to innumerable passageways, tunnels and rooms, there is a huge central chamber approximately 50m high and 75m wide. Following the river to the north, this chamber narrows to a tunnel more than 150m long and 30m wide. The roof slants slowly downward to a height of 12m above the river where it exits the cave. In this chamber and tunnel live 95% of the oilbird colony.

The character of the river changes radically with the onset of heavy rains. Great torrents carrying logs, trees and rocks shake the cave.



AN OILBIRD as drawn by Humboldt.

Above the high water line, against the walls of the cave and on ledges, several meters of reddish-brown guano have accumulated, a powdery mass of decomposing fruit, seeds, regurgitations, fecal matter, bits of old nests, insects, egg shells, etc., along with sediment eroded from the walls and roof of the cave. Insect, fruit and nectar-eating bats contribute to the guano deposits.

Despite the lack of light, the cave teems with animal life. The guano supports a large number of insects, particularly small 'polillas,' the larva of moths that feed on seeds. Small mice or 'ratones de monte' have burrowed thousands of small tunnels and holes near the entrance of the cave floor, thriving on fruit, eggs and baby birds that fall from nests.

In the antechambers and branches off the central chamber, sections untenanted by oilbirds, many bats thrive. Most of the captured specimens were frugivorous (Sturnira erytsiromos, Vampyrops vittatus, Vampyrops sp., Cavollia perspicillata), one an insectivore (Myotis sp.), and one nectar feeder (Anoura geoffroyi).

The bats and oilbirds appear to respect and maintain separate territories. I never observed bats and oilbirds flying together in the cave. On arriving at the cave in October, I noted a single oilbird in the central chamber with 40 bats. The bats retire to more remote sections of the cave when the oilbirds return from their migrations. It seems that bats can little tolerate the racket made by the oilbirds.

In the rocks surrounding the three main entranceways to the cave, the 'gallitos de roca' (Cock of the Rock, Rupicola peruviana aequatoriodis) takes up residence from February to April. Inside the cave near the entrances, I saw three 'vencejo' (European swift or black martin — Strepto procne zonaris) nests during February, March and April. The martins return to the cave in the evening to spend the night grasping the rocks, using their wings and tail for additional support. They leave the cave at dawn.

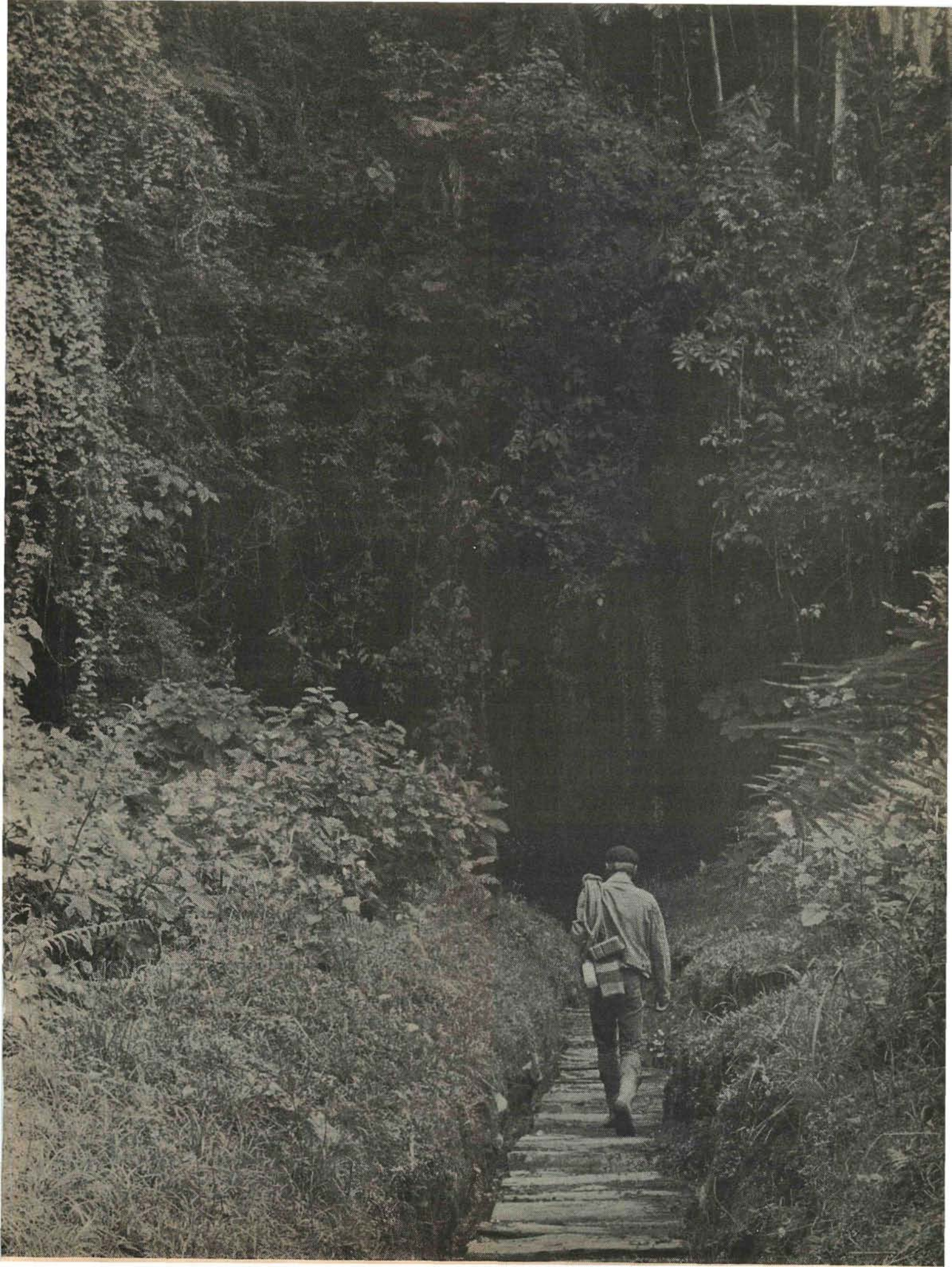
In a small hole on the west cliff face, where the river enters the cave, I found various hummingbirds (Chlorostilbon poortmani) nesting in February, March and April. On the east wall, where the river leaves the cave, a Passeriform (possibly Pyrrhomyias cinnamomea) cared for two young in March and April.

SPECIES DESCRIPTION: Humboldt classified the oilbird with the scientific name Steatornis caripensis, or 'oily bird of Caripe' because between the legs of the younger birds is a thick layer of edible fat. The relationship between the oilbird and other species of Caprimulgiformes was confirmed by several anatomic studies: Muller (1842), Sclater (1866), Garrod (1872), Parker (1889), Wetmore (1918), and with egg albumin analysis by Sibley in 1960. In fact, the oilbird is considered the only known member of the Family Steatornithidae of the above order.

The adult oilbird is comparatively large, approximately 50cm long, with a wing span of more than a meter. The plumage is reddish-brown, with copper-bronze tones and white markings in distinct sizes and shapes (hearts and diamonds). Although sex differences are not easily seen, there is, on close inspection, a slight variation in color — the male has somewhat more of a metallic grey sheen while the female is more reddish-brown.

The head is large, wide, receding, the crown covered with small, light-grey feathers marked with tiny white spots. The bill is very wide and strong, with the maxilla sharply hooked like an eagle's. The mandible has long bristles on its point. More long bristles radiating from in front of the eyes, hang over the length of the beak.

The oilbird's tail is impressively long, measuring 5cm longer than half its total body length. Five pairs of feathers of different and progressive sizes form a dihedral angle (like an inverted 'V'). The tail's length and the inverted 'V' form are used



ABOVE & BELOW: An oilbird hovers near its nest by moving its wings up and tail down simultaneously and then reversing this motion.

to great advantage when it flies in caves.

Among ornithologists, the oilbird is considered to have weak feet for a member of the Caprimulgiformes. I disagree completely. Many times I witnessed an oilbird unable to alight as a result of social pressure or for some other reason. Eventually desperate for rest, it would grasp small rock outcroppings on the wall with its claws, and, in a completely vertical position, support itself with its wings and tail, as does the black martin. This may explain why some oilbird tail feathers look worn out.

Another case, noted February 21st: 'In the morning, Dusty, David and I saw an oilbird completely upside down, hanging by its feet from the ceiling of the cave, its wings and tail spread to the maximum. The bird sustained this position for some 15 minutes.'

Although oilbird feet are not specially adapted to clinging to vertical walls, all my observations indicate that the oilbird finds many uses for its feet in daily life, including the very construction of its nest.

FREE FLIGHT, LANDING, HOVERING AND SOARING: The oilbird is wonderfully adapted to flight in caves. Large wings and wide tail help it to maintain slow flight and maneuver agilely in restricted spaces. Oilbirds fly around a cave in circles and figure 8's, hovering when necessary.

On oilbird aerodynamics, Snow says:

> Low wing-loading (total weight/wing surface area) allows the bird to fly slowly (one or two knots per hour), maneuver easily and carry heavy loads. The low 'aspect-ratio' (total wing span/average width of the wings) allows Steatornis caripensis to have low 'wing-loading' without a larger wing span — an important adaptation in dominating narrow cave passages.

I had excellent opportunities to see oilbirds hover — an important ability for social interaction and landing in nests on narrow ledges. To stop its flight abruptly, it hovers, extends its feet, heads towards the nest and lands on the rim.

To hover prior to perching, shallow wing flaps change to a deep, sweeping accelerated beating of the wings. The tail also begins to accelerate in a vertical movement.

Stolzman (1880) noted that the inverted V-shaped tail is a specialized adaptation for hovering. He compared oilbird tail movement to hummingbirds, supposing that the dihedral form of the inverted 'V' elevates the body in its downward sweep and encounters little resistance when raised.

An excellent observation. The tail is in a down position when the wings are raised and vice versa. I saw oilbirds hover 6-7 seconds before landing.

Although I never saw oilbirds picking fruit, Stolzmann describes oilbirds hovering while feeding on palm and tree fruits. At night, I have seen oilbirds soaring between trees with great agility. On the various occasions, I saw them, like birds of prey, close their wings and swoop into the woods below. Outside the cave, oilbird wing beats are short, shallow, and, all in all, faster. Snow reports speeds up to 16 knots/hour.

ORIENTATION, ECHOLOCATION: Griffin (1953) studied the oilbird's natural radar system (echolocation) in Cueva de Caripe — acoustical orientation guides them around dark caves, similar to bats, with the difference that the sounds emitted by oilbirds are

within the range of human hearing, (6,100-8,750 cycles/second), each pulse lasting one microsecond.

It is interesting to note that sound pulses synchronize with wing and tail movements, speeding up when the bird nears an obstacle, such as a wall.

SMELL: Snow (1961) wrote that the oilbird's well developed sense of smell helps it to locate fruit and identify other oilbirds. On the other hand, Dr. Jorge Hernandez of INDERENA observed that while oilbirds do feed on assorted aromatic fruits, some fruits in its diet do not appear to be aromatic, at least the smell is not perceptible to humans. Such is the case with fruit of many palms, e.g. Ceroxylon sp. and Euterpe sp..

Snow indicates that oilbirds, themselves, give off a rancid smell. This we could verify. It is the same smell as the guano, and impregnates the cave. However, this odor is probably not produced by the oilbird but picked up from its environment.

When I neared a group of preoccupied birds in a completely dark area of the cave, they did not notice me if I approached down wind. Going up wind, however, they immediately sensed up my presence.

It is still not known how, in complete darkness, an oilbird locates and distinguishes its own nest among thousands.

Several explanations have been advanced to account for this feat: 1.) It may be the result of social cooperation or more precisely, vocal and/or physical repulsion by birds in neighboring nests. 2.) Or it may be clues derived from the two constant elements in the cave — air and water. Waterfalls, for example, to give off varying noise levels. Wind currents are stronger in certain areas.

NOCTURNAL ACTIVITIES: The oilbird, like some of its Caprimulgiformes relatives, is nocturnal. Around 6pm, oilbirds wake and start to stir, making a commotion. About 7pm, the first birds leave the cave. Most have departed by 8pm, although we never found the cave totally without oilbirds, even during periods of migration.

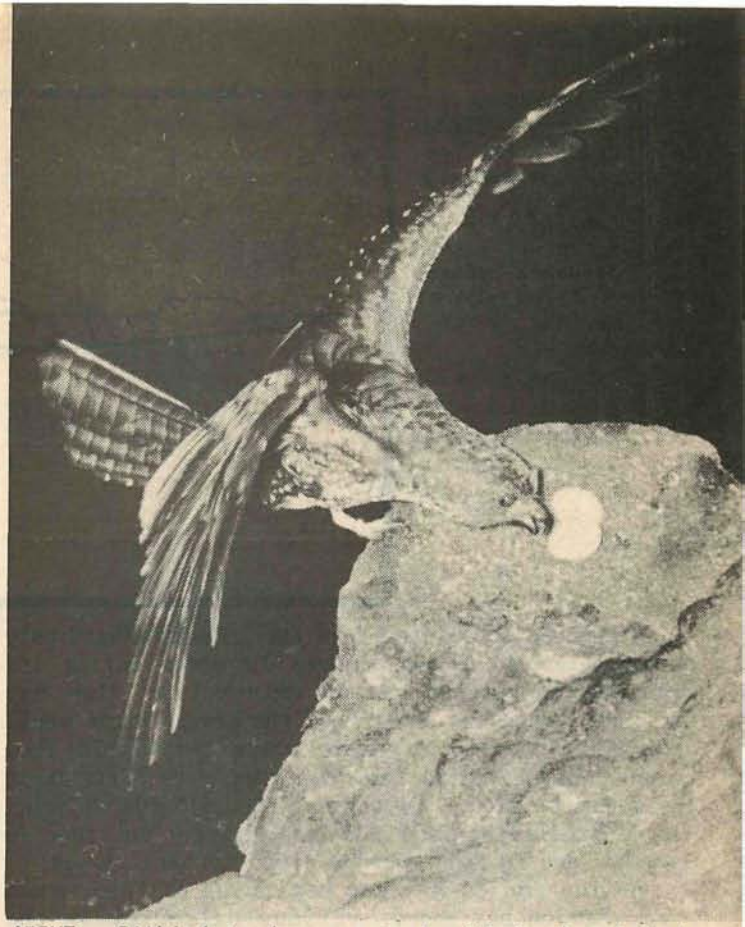
At 4:30am, the first birds return. By 5:30am, most are back, shrieking loudly, feeding and fighting until 9:30am when almost all activity stops. I recorded a singular event: 'On February 13th, an oilbird entered the cave at 7:30am.'

During the day oilbirds in the darkest parts of the cave remain more active than those in areas with some light. During rainy or moonless nights, oilbirds delay leaving the cave.

POPULATION: Question: Where do oilbirds migrate? Answer: No one knows, but there are a few theories.

The pronounced shifts in population densities of oilbirds suggests migrations and movements within each species.

Commenting on the Andean oilbird population in Colombia, Hernandez suspects local migrations and dispersions away from nesting areas. There have been no sightings of oilbirds in the dense, humid jungles of the Amazon with the exception of one bird captured on the Apaporis River in 1951 by Dr. Federico Medém. However, jungle areas are large

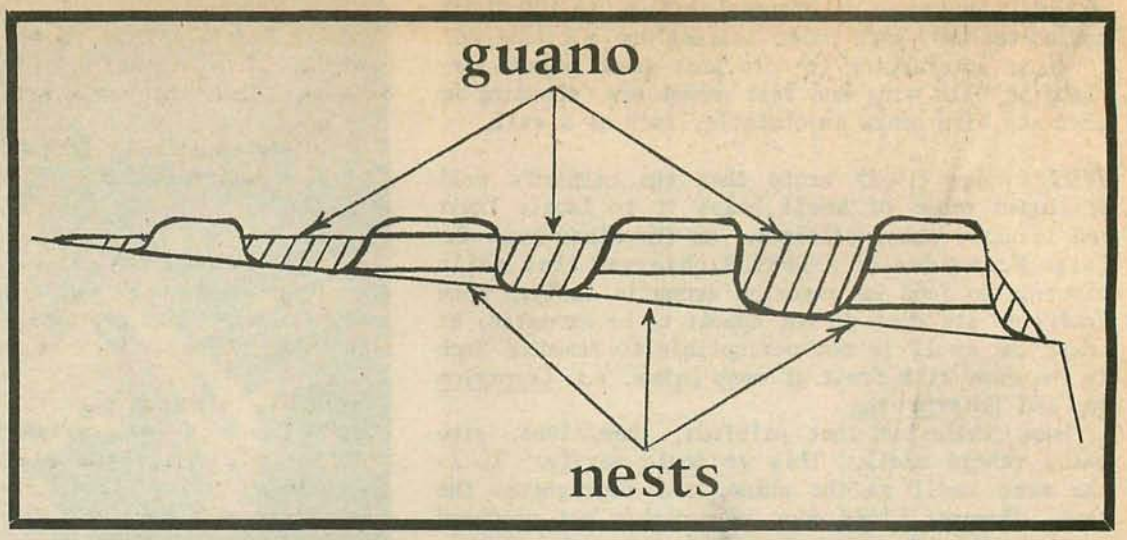


ABOVE: Oilbird lands on a nest with head and feet forward. BELOW: Very young chick with eyes closed.

potential food sources (e.g. palms such as Jessenia polycarpa and Euterpe sp.). Isolated, with low mountains and caves (e.g. the Serrania de Araracuara), it is conceivable that oilbird populations live there.

Also, comparatively little light penetrates the dense forest canopy, and oilbirds might easily perch on shaded branches. Other Caprimulgiformes, while also nocturnal, rest or sleep in light shade or full daylight (e.g. Nyctibius grandis).

WHERE nests are arranged along a slanting wall, the lowest ones are built up in a multiform fashion to rise above the wet guano produced by the birds above.



Hernandez speculates that the Andean oilbird only congregates in large numbers in caves during its reproductive period. After reproduction, they may no longer need the shelter of the cave. Birds would naturally migrate to areas where they could feed more easily. Huila Cave is 30km away from their palm fruit source. Of course, the oilbirds of Trinidad, studied by Snow, do not migrate, but this is perhaps due to food sources close to their caves.

At the end of May and beginning of June, when reproduction has ended, various balconies in the cave once populated are found empty. Unfortunately, we were not able to stay and see if migration was total. Most of the birds returned in January.

NESTS: It's not known if oilbirds return to the same nest each year. We did note that the first birds to arrive occupied the choicer nests in priority areas. Nests preferred by oilbirds should be:

1.) In a dry area. The cave is extremely humid and streams of water run down the walls. It is difficult to warm eggs and young in a damp nest.
2.) Inaccessible to land predators.
3.) Located in a dark area, as the birds are nocturnal.
4.) Well situated. The best nests are on a cliff edge, set apart from neighboring nests, and without obstructions such as a low roof to hinder landing and flying.

Conditions 1 and 2 appear to be of particular importance to the birds. Abandoned nests failed in several or all of the above conditions. All possible nesting sites in the Huila Cave seemed occupied. I saw no nests of recent construction.

Nests are not made of fecal material — the birds carefully defecate beyond the nest's rim — but of regurgitated stomach contents which, when fresh, is a dark green or dark reddish-brown greasy paste with bits of fruit, possessing a strong (and disagreeable) fruity odor. Over several weeks, or sometimes months, this material dries and becomes brittle and powdery. The color fades.

The structure of the nest appears to be of agglutinous nature, but it is not yet known if saliva is a constituent of the regurgitated matter, as with other species that use saliva to cement their nesting materials (e.g. oven birds [Furnariidae], some hummingbirds and swifts).

With beak and foot-tamping, the oilbird models its nest. I saw a male shaping the rim of a nest. The female, sitting on eggs, regurgitated material over the site under construction. One could see how, in one single movement, the regurgitated matter was expelled and laid down in horizontal and vertical movements with her beak. Taking short steps back and forth, the male formed the rim.

Oilbird nest structure is complicated, but expertly executed. Irregularities in the rock walls and cliffs, the humidity, and, in some cases, the ever-growing level of guano, pose construction problems.

Then, too, dripping water will slowly dampen a nest. In such cases, oilbirds build another nest or part of a nest on top of the old one. Over the years, a nest can take on the form of a 'skyscraper' — in some instances five nests high. Where nests are arranged along a slanting wall, the lowest ones are built up in a multiform fashion to rise above the wet guano produced by the birds above. The graph shows lower nests progressively higher — some 30-35cm high (approximately one foot).

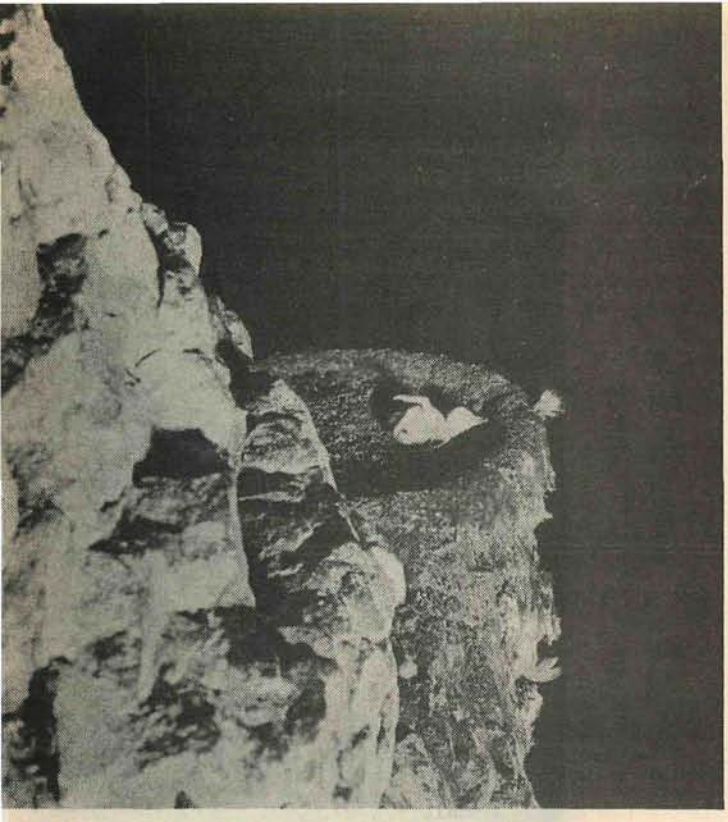
Oilbirds will abandon a nest when: 1.) upward construction becomes impossible due to some physical obstacle, 2.) humidity threatens the nest, 3.) the guano level rises too high, or 4.) further building can't be supported by the substructure.

To estimate the age of the nests, I cut a 4 X 10cm slice from a nest — restoring the piece after a week — and concluded that many of the nests may be hundreds of years old.

SOCIAL STRUCTURE AND BEHAVIOR: As I mentioned before, there appear to be preferences in the selection of nests, with first arrivals taking the most desirable.

I noted six large sub-colonies within the cave. Oilbirds are closely paired, but there were some indications of a supra-structure.

Birds nesting closest to the cave entrance were



A YOUNG oilbird chick lies in a skyscraper nest.

the last to leave on any given evening, and those dwelling furthest back, the first. A possible explanation for this might be aggressive territorial defense since birds nearest the exit shriek and persecute birds flying out past their more desirable nests.

When startled, oilbirds will fly around the cave chamber before returning to their perches. The first to leave return without problems. Birds who leave a bit later are subjected to harassment when flying near occupied nests, showing that territory is well defined.

Oilbirds leave the cave singly, forming up in groups of 2–10 once outside the cave. The first to depart adopt a noisy, circular holding pattern until the rest arrive. Then together, they can set off to feed.

I observed that when birds were recently returned to the cave from a migration there was much fighting. Such confrontations may not only relate to territorial rights, but be part of the mating ritual.

On one occasion, I noted two males attempting to mate with a female. One male was already perched on the rim of the nest when a second male approached. The dominant male screamed threateningly and attacked with his beak, driving the intruder off. Whenever I neared a nest occupied by either a male or female, deep guttural calls warned me off.

Preening goes on before, during and after incubation. The male combs the female's crown feathers with his beak.

Both sexes take turns incubating the eggs and warming the young. In one pair I observed, the male grew restless after stand watch after an hour and a half. Stepping down from the rim of the nest, he turned around a few times and approached the sleeping female sitting on the eggs. They exchanged places. This 'changing of the guard' takes five mimutes. Then the birds settle down quietly once more.

Female's underbelly feathers are more bulky and fluffy — better suited for incubation than those of the male.

EGGS AND NESTING: The egg resembles a small, somewhat rough chicken egg and weighs 20 grams. I saw no nest with more than two eggs. The average number of eggs among 135 nest I calculated at 1.2 eggs/nest.

INCUBATION: Although eggs are exposed at night when parents leave to feed, they are guarded and heated constantly as hatching time approaches (starting approximately day 25). I repeated one of Snow's experiments and separated two eggs by 10cm. When the female returned, she sat on one egg. When she noticed the uncovered egg, she showed signs of fright and fled the nest. On returning, she again ignored the uncovered egg, but after 25 minutes, maneuvered it back along side the other.

In another experiment, I took one egg from a nest containing two and put it into an empty nest. A mated pair accepted the strange egg and cared for it.

The female does not develop an 'incubation patch' during this time. Incubation varies from 32–33 days. The time between laying the first and second egg is 2–5 days.

THE YOUNG: The young tediously peck an uneven hole some 10mm in diameter through the pointed end of the egg. The emerging chick is rosy, naked, its eyes closed, and the beak soft. It emits a high scream.

Parents try to keep chicks covered constantly over the next week and a half, taking turns to forage and feed the chicks with semidigested food. After two weeks, the young can eat small fruits.

At three weeks, dark plush feathers appear. A the end of week five or six, the young are well covered with down, eyes open, and the shrill scream grows louder.

I noted adults returning to the cave three times in one night to feed their brood — at approximately 11pm, 2am and 5am.

In nests with two chicks, on almost always shows noticeably larger development. The difference is even more apparent in older chicks. In one case, a 12-week-old chick weighed nearly 250 grams more than his sibling, his size allowing him to compete more effectively for the food meted out by the parents.

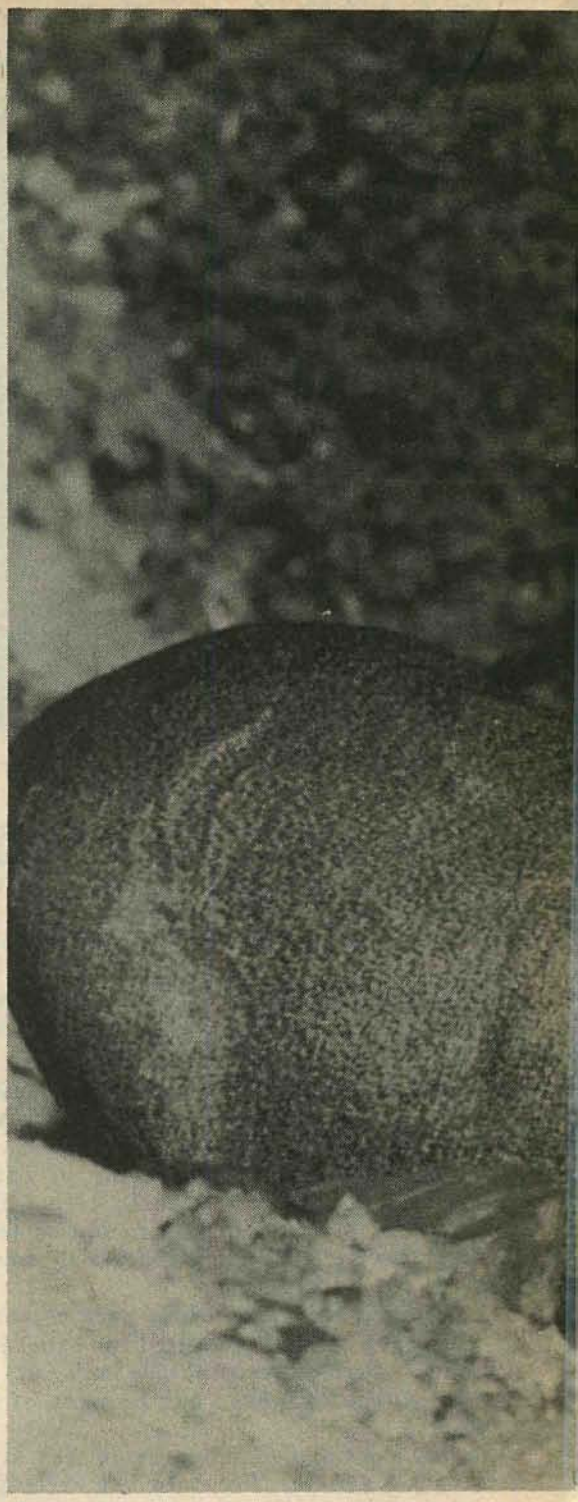
At around eight weeks, tail, wing, chest and head feathers appear. These feathers will be well developed in two weeks, but the rest of the body will still be covered with immature, downy feathers.

By week 12, the young sport adult plumage, their cry has grown deeper and fuller. In a week or two, the young resemble adults and will be experimenting with flight by week 15–16. ■

This study was initiated and supported by the Institute of Renewable Natural Resources of the Republic of Colombia and the Peace Corps (Colombia).

THE HUEMUL

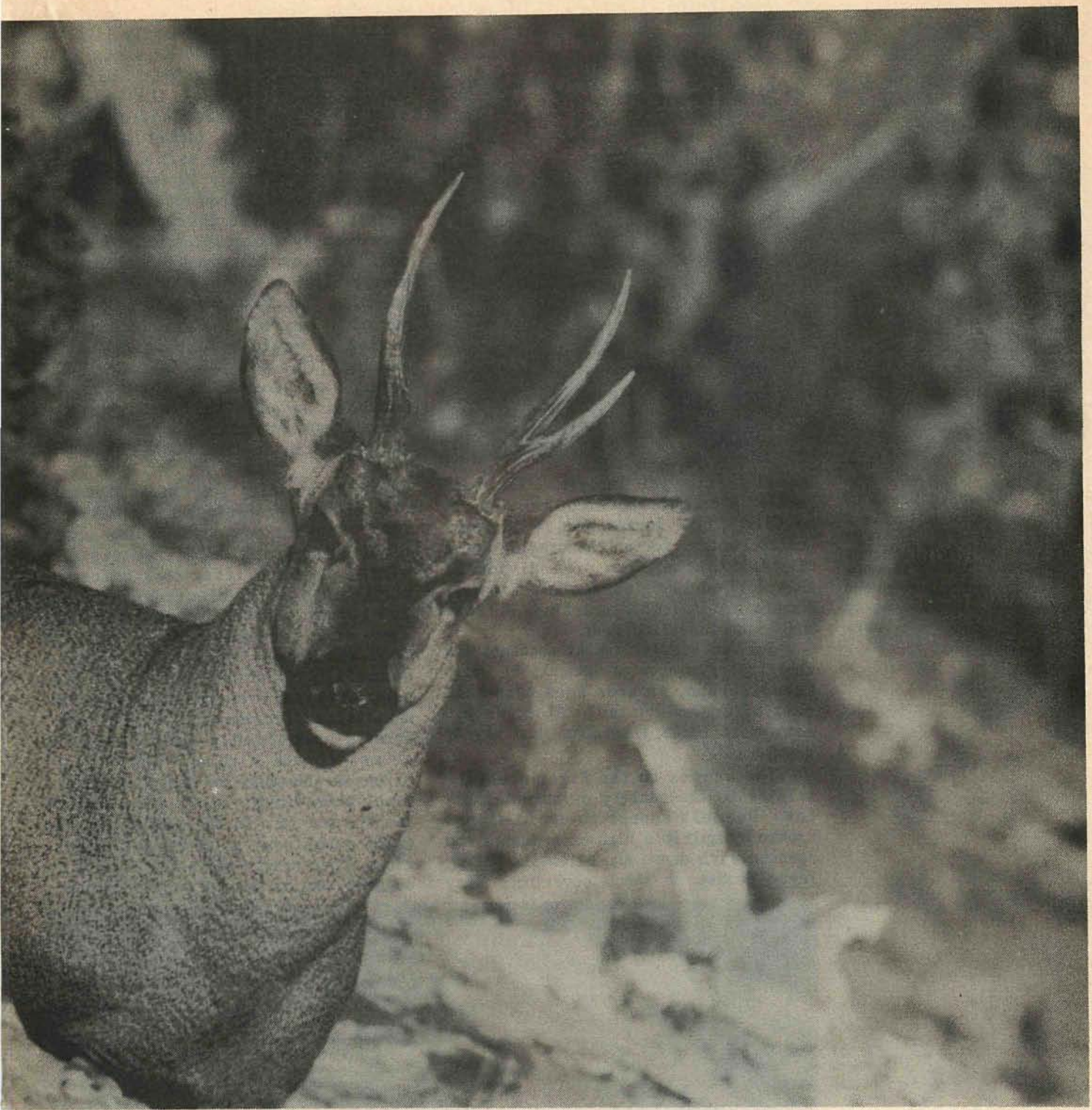
By Tony Polvilitis



At the request of Chile's Department of Conservation, Dr. Tony Povilitis, with support of the Chilean Forestry Corporation, the University of Chile, the World Wildlife Fund and EARTHWATCH, conducted the first research of the endangered huemul.

Along the Río Claro of Chilean Patagonia, in distant view of the pampa, lies a flat-topped mountain with a steep north slope flaring 800 meters above the river. Here, valley colonos reported sighting el huemul, estimating the group at 15 animals.

The huemul, or Andean deer, is an endangered species. Throughout its entire south Andean range there may be less than 1,000 individuals. Yet, the huemul's popularity belies it numbers.

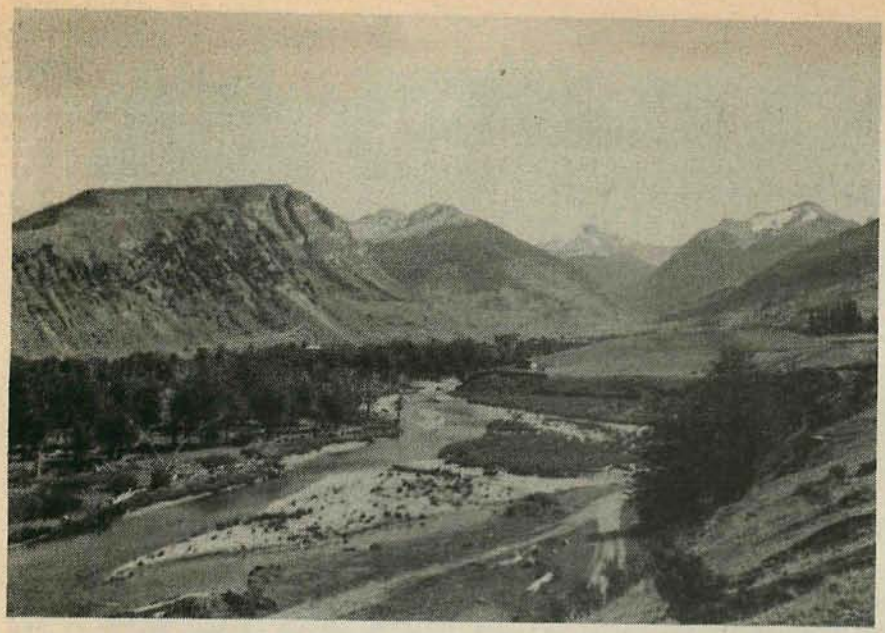


It plays a prominent role in mountain folklore, is proudly displayed on the Chilean national coat-of-arms and is represented by the popular media as a species deserving special concern.

Forestry officials and conservationists familiar with the Río Claro area hoped this small herd might be part of a larger population and despatched census teams to search 57 square kilometers of rugged terrain over a three-week period. Counting individuals and calculating the presence of other huemuls by a study of track distribution, team members combed the suspected habitat and came up with a minimum population. Further study around the flat-topped mountain now called Cerro Huemules helped validate the census.

Along with Cerro Huemules (7km^2), two other prominent mountains near the Río Claro, Cerros Cordillerano (16km^2) and Cuatro Puntas (34km^2), make up the

ABOVE:
Huemul buck.
Note his sharp, pointed, biforked antlers and dark face "mark."



ABOVE: The Río Claro of Chile with (left to right) Cerros Huemules, Cordillerano and Cuatro Puntas. BELOW: Bucks preparing to spar.

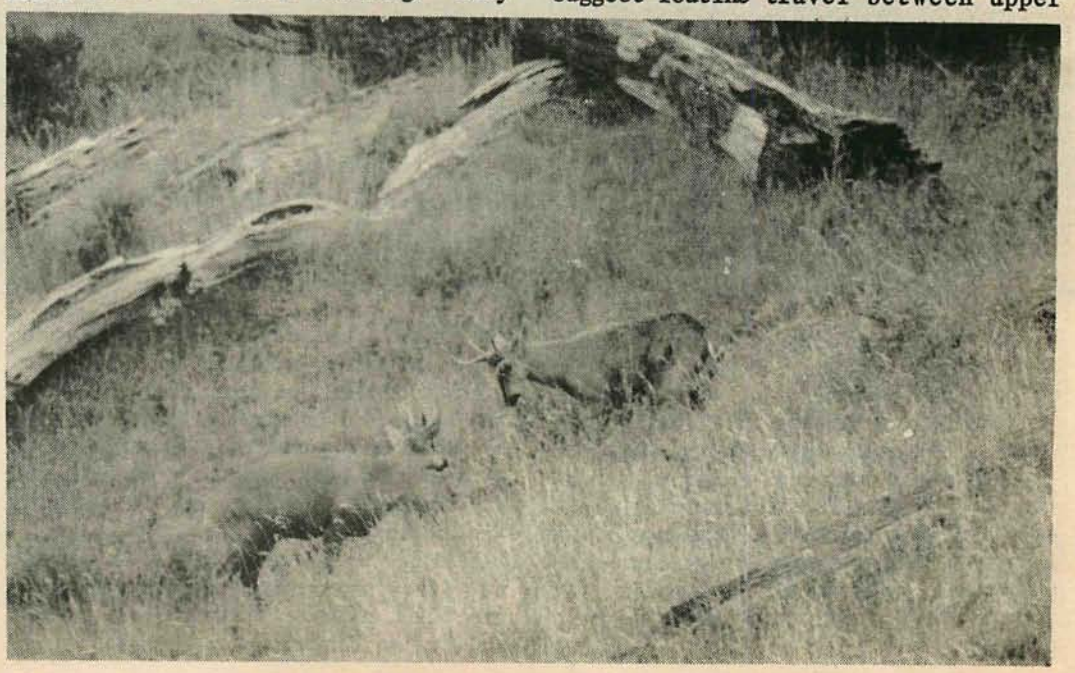
huemul's principal habitat. The team located 9 huemuls on Cerro Huemules, 21 on Cerro Cordillerano and 14 on Cerro Cuatro Puntas, for an encouraging total of 44. A breakdown of individuals showed 17 adult males, 6 adult females, 1 male and 1 female yearling, 3 fawns and 16 unclassified deer.

Curious results. What accounts for the greater number of huemuls at Cerro Cordillerano, an area less than half that of Cuatro Puntas? Also, why so many more bucks than does, and why so few fawns?

The answer to the first question relates to the quality of huemul habitat. Huemuls appear to avoid slopes broken by multiple high escarpments and covered with dense and extensive Nothofagus forest or shrub covering. They seldom frequent areas heavily littered with fire-killed wood or areas with dense secondary vegetation. The first condition characterizes the east and west slopes of Cerro Cuatro Puntas. Furthermore, fallen timber and dense shrub make sizeable areas along its north slope virtually impenetrable.

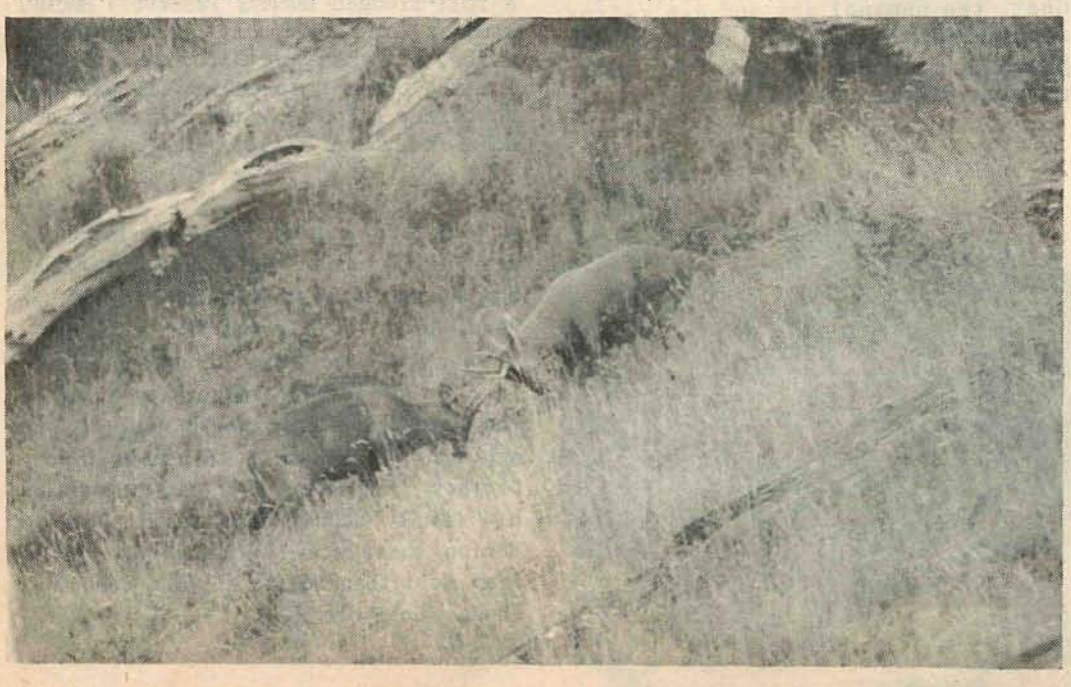
Actually, differences in population density among the three areas might have been even more pronounced had not soil erosion destroyed proportionally more habitat at Cerros Cordillerano and Huemules. It was common in an earlier period to burn off land in the mistaken belief it would become suitable for grazing. This was done to many of the lower, more accessible slopes in the southern Andes. The result — the terrain now supports few animals, be they domestic or wild.

While avoiding some areas, huemuls clearly prefer others. Most deer (48%) ranged along north-facing slopes of high topographical diversity (ravines, coves, cliffs, rock outcrops, etc.), with small clearings in shrub and forest created by wind and fire. These areas provide a wide selection of food and excellent protective cover. Huemuls (30%) also occupied the high secondary valleys that partition the mountains, frequenting virgin beech forests, particularly those with ready access to the alpine. These woods offer an abundance of forage at ground level where breaks in the forest canopy let the sun it. In the alpine, huemuls (22%) sought out good ground vegetation. Deer trails above the timberline suggest routine travel between upper



valley forests and diverse habitat along north slopes.

While we know that huemul distribution corresponds well with habitat quality, the odd huemul sex and age ratios defy simple explanation. It may be that does with young fawns seek isolation and seclusion, and therefore eluded the census. Otherwise, one would have to assume that over 80% of the unclassified deer were females for the sex ratio to balance. But this is a dubious assumption. At Cerro Huemules in the fall of 1980 and 1982, the census-by-recognition technique came up with sex ratios 7:3 and 7:4 in favor of



ABOVE: A yearling doe cautiously approaches. She has exceptionally long ears. BELOW: Bucks sparring. This is <u>not</u> fighting, but more closely resembles a wrestling match.

ABOVE: Huemul buck.
BELOW: Habitat destruction by fire and cattle on Cerro Huemules. The east slope of Cerro Cordillerano on the right is covered with native forest.

bucks! Only single yearlings and no fawns were observed.

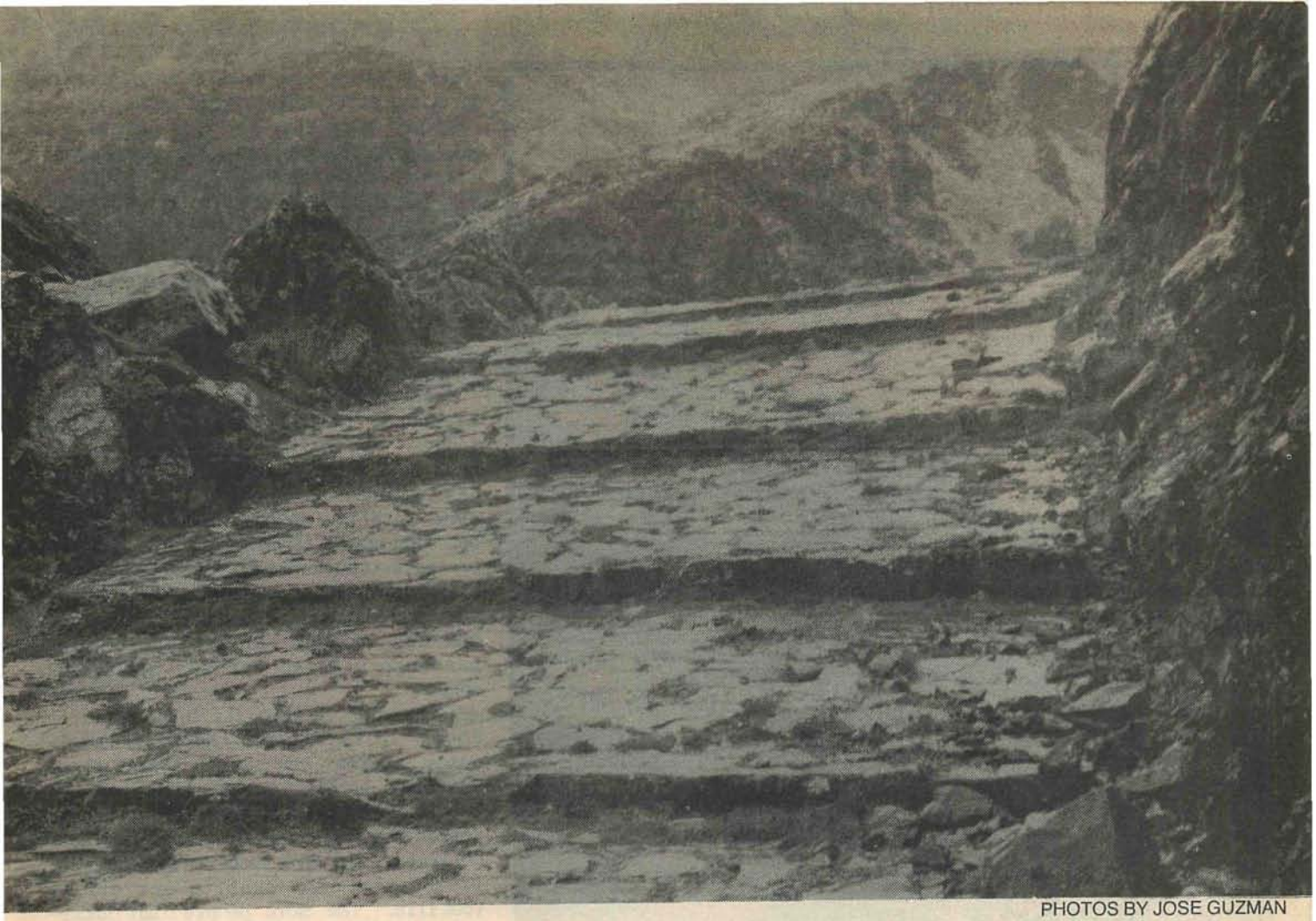
Based on experience with other deer, the unusual sex and age ratios for huemuls might be linked to the physical condition of does and, ultimately, to the quality of habitat. In poor habitat, a greater proportion of young are males, females produce few young, and postnatal mortality is high. Rio Claro huemuls, however, appear to be in good condition. Little browsing pressure was noted, even at preferred localities. Could some hidden stress factor be responsible? Possibly. Yet, the actual explanation may turn out to be considerably less ominous.

Huemuls, unlike many other deer may rarely, if ever, give birth to more than one fawn. At four distinct sites in Chile I have, over the years, observed eight maternal females. All had a single offspring. The sighting of two does with yearlings after the 1982 fawning period may even suggest that some females bear young only in alternate years. For whatever reason, low productivity by itself may not necessarily be bad, but huemul populations, once reduced, would be relatively slow to recover.

Is it possible that habitat conditions for huemuls at the Río Claro are improving? Can more typical sex and age ratios be expected in coming years? Many areas, once ravaged by fire yet relatively free of cattle, now provide a windfall of palatable forbs and shrubs for the huemul. And since the construction of a guard station at Cerro Huemules the deer have grown accustomed to people and commonly forage near the base of the mountain.

Chile's Forestry Corporation (CONAF) has established a 200-hectare protected area for the huemuls at Cerro Huemules. This may soon be expanded to a full-fledged huemul reserve. Huemul studies are continuing at Cerro Huemules, with behavioral research planned for the upcoming breeding season. Results may help solve the mystery of the odd sex and age ratios. ■

Acknowledgements: This project was carried out under the auspices of CONAF and sponsored by EARTHWATCH (10 Juniper Road, Box 127, Belmont, MA 02178, USA). Members of the team included Chilean forestry officials, university students and volunteers from North America who applied to EARTHWATCH to assist in the project. Professor Patricio Guzman and his family accomodated the volunteers during their stay in Coyhaique, Chile. I am most thankful to all who made this census possible.



PHOTOS BY JOSE GUZMAN

the takesi trail

By Ivan Augsburger

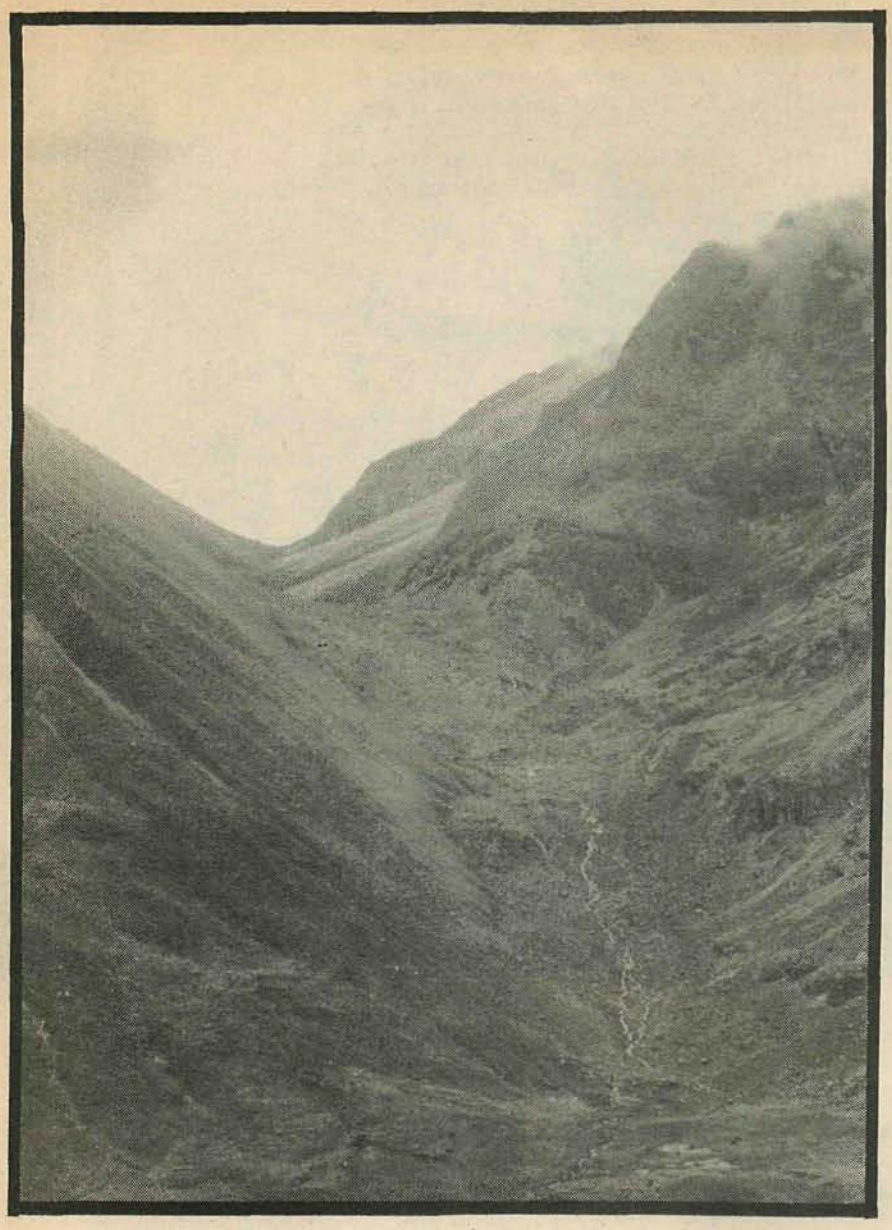
The Takesi Trail is named after the rock-walled, hobbit-like village through which the trail passes midway in its length from the cities of Ventilla to Chojlla. It connects the high Andean plateau to the beginning of the subtropical jungle of Yungas east of La Paz.

The trail is about 50 km long — climbing to 4,650 meters above sea level, later dropping to 2,100 meters (boring data which mean a lot to some people). More interesting, the trail winds along several explorable mine shafts, passes expansive grazing land, large llama herds, and glacier lakes with waterfowl. Always close to or overlooking raging mountain streams and in constant sight of towering snow peaks, it takes one into ruins and quaint, forsaken Aymara Indian villages.

'Trail' is hardly the proper description for nearly half the hike since a good bit of the way is a veritable highway as wide and impressive as the best preserved stretches of imperial Inca roads that still exist. Not even the famous Inca Trail to Machu Picchu in Perú is in such splendid condition.

It's is best to begin early — soon after 6:00 am, since the main difficulty with the Takesi Trail is getting to and from it. First, one must get to the village of Ventilla (not 'Ventanilla' as the Bradt's call it in their guidebook). We adhered to

THE TAKESI Trail follows some of the best preserved pre-Columbia road in existence today.



THE LAST haul to the pass at 4,650 meters. Pray for a cloudless day, because the view is spectacular.

the information in the pamphlet given to us at the tourist information center on Pardo in La Paz. It advised us to catch the bus at Plaza Belzú. Not knowing the whereabouts of Plaza Belzú, we took an early morning taxi. Arriving in the plaza, we found two buses, but both drivers swore they did not go to Ventilla. Instead, they sent us uphill to another plaza. At this second plaza, we were sent to yet another plaza further on where we learned that 'perhaps' there might be a bus to Ventilla at 2:00 pm.

At this point, we turned to the very good instructions given in Bradt's Backpacking and Trekking in Perú and Bolivia. It recommends taking the Ñ bus 'along the Prado.' And, indeed, various officials, sidewalk merchants and other bus drivers assured us we would find the bus there. Well, we waited 'along the Prado' for over half an hour, after which I did some exploring and found that the Ñ bus route now passes along Murillo — a parallel street. Take Note!

The Bradt's book says that you must walk the kilometer from Cota-Cota to the checkpoint, but this is no longer necessary. The Ñ bus has apparently extended its route to include the checkpoint stop at Chasquipampa. Don't do what we did and get off the bus too soon.

The officer at the checkpoint shook his head, 'No more buses to Ventilla today. Mañana.' As we were about to head back down the road to La Paz, we saw a blue and white bus to Ventilla come rattling up the hill and hopped on. We could swear that this was one of the two buses we had seen waiting in Plaza Belzu that morning. Hmm....

Five minutes beyond the checkpoint, our bus stopped for breakfast. The passengers piled out for a bowl of soup.

The ride to Ventilla takes about an hour. In late 1980, the fare was 15 pesos, whether you sat in a seat or on someone's bundle in the aisle.

Tell the driver, tell the youth who serves as his assistant, tell the fare collector and everybody else who will listen that you want to get off at Ventilla. The more people that understand this vital fact, the better your chances that one of them might remember to tell you when the bus arrives in Ventilla. No signs identify the village, no welcoming billboards set up by the local bank, no nothing.

Just past the village center, that does not even appear to boast a bank, is the trailhead. Hikers of the trail have become so common that the bus driver may know to drop you off at the little dirt road that leads up to the Palca Valley. If a jeep happens along this dirt road, flag it by all means. Your destination is the beginning of the Inca road. A ride will save you about three and a half hours, or 10 km, of uphill walking.

On foot or on wheels, you'll pass the quaint rock village of Choque-kota which is, except for some of the bigger buildings, the clothing, and the bottled drinks offered for sale, largely untouched by modern Western culture. Half an hour beyond the village at the entrance to the pampa stands a church with a graveyard. Nearby, llamas graze with other livestock below the snows of Cerro Murura-

ta, 5,950 meters high.

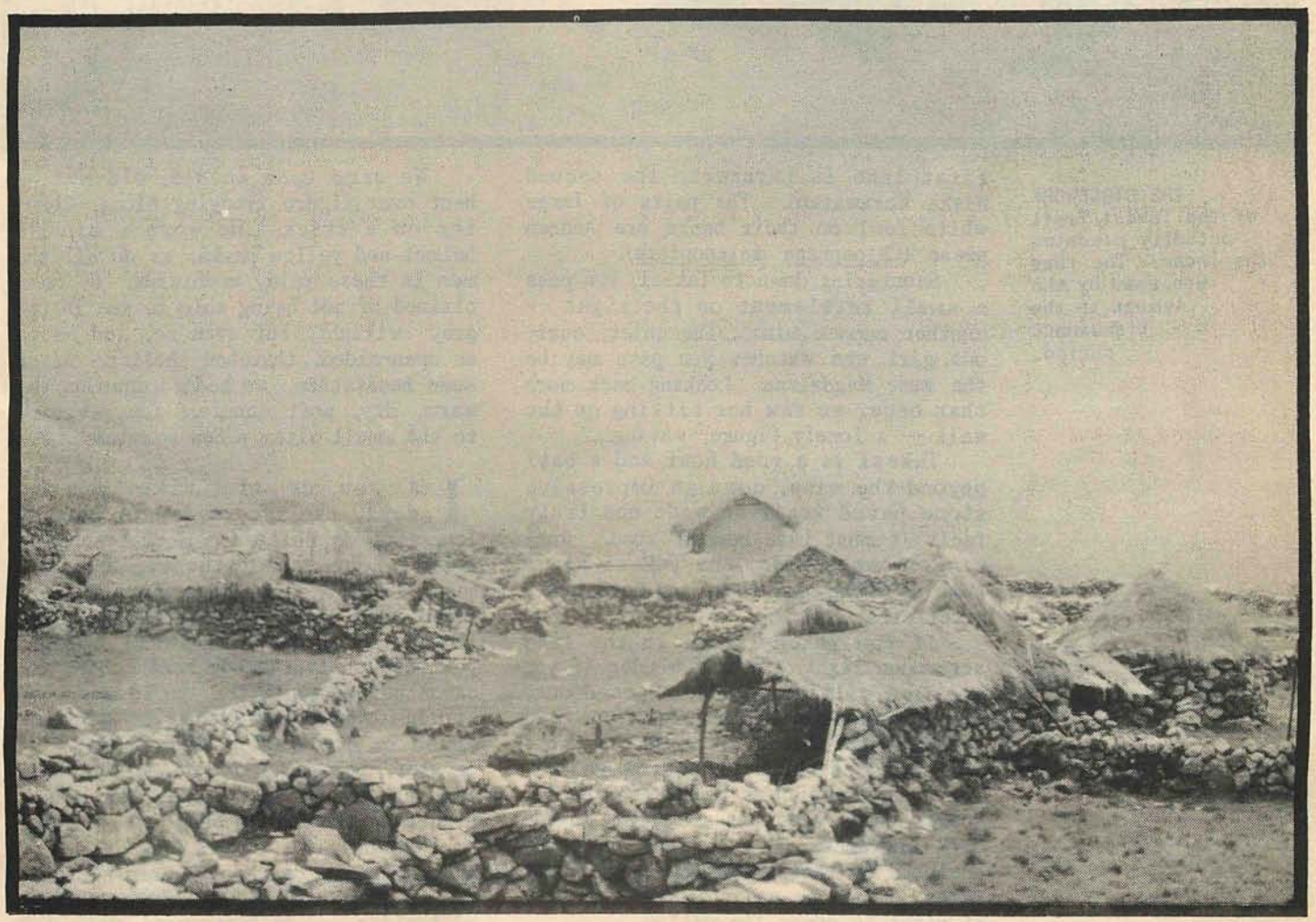
Crossing a clear steam on your left, you come to three boulders on each side of the road, adorned with religious folk art. Nearby is a small building on the right. Take this narrow road that forks away to the right — the wider, or main, road continues for another half kilometer to the San Francisco mine.

At this fork are the ruins of Kiucha Kuchu. Rock walls still stand among water holes. This ancient settlement marks the beginning of the pre-Columbian road. Here, at the beginning of your walk, are many of the best preserved stretches of the magnificent highway. This road actually predates the Incas and was used by the Aymara in the Tiahuanaco period.

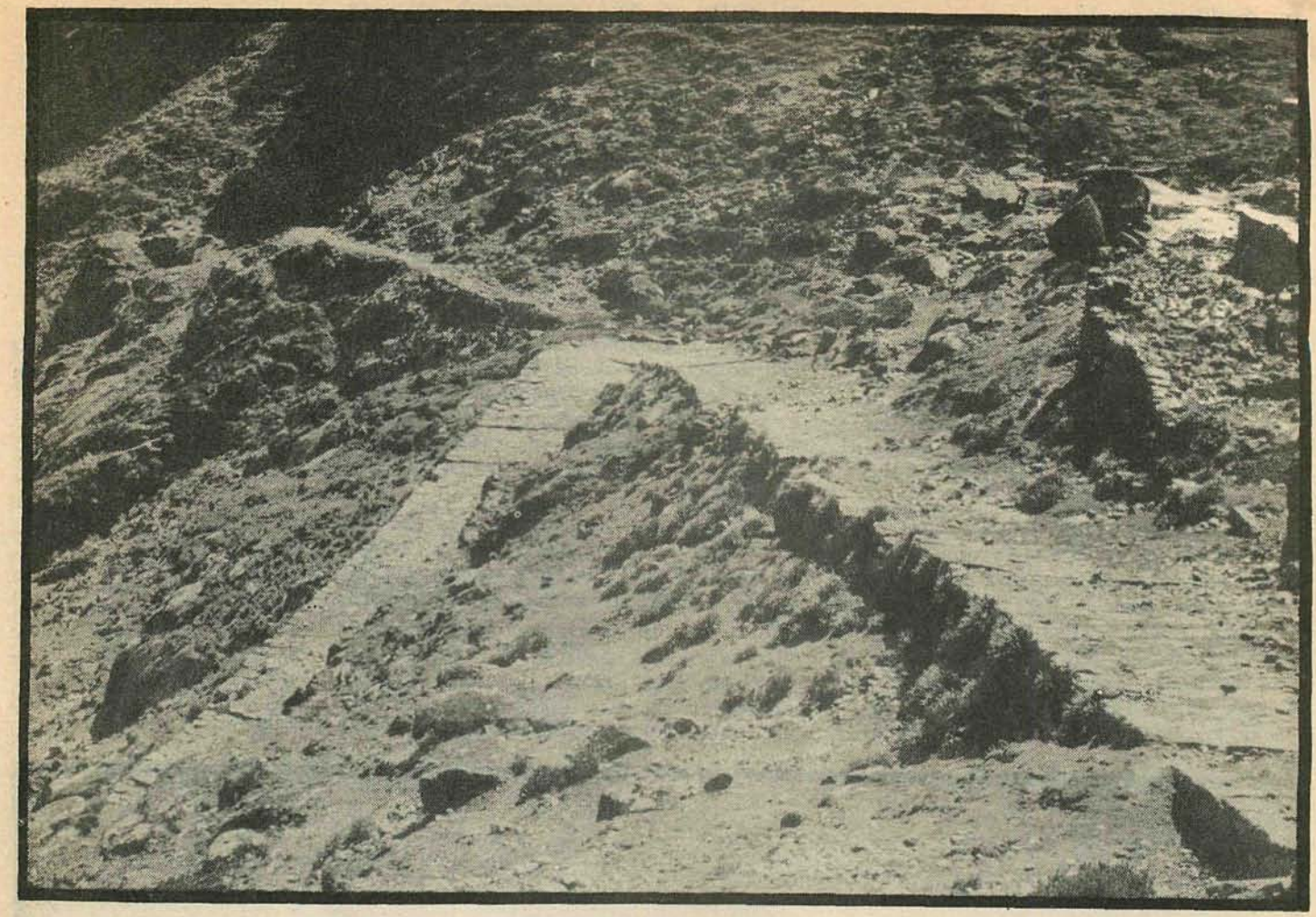
An hour's climb brings you to a rock enclosure, some channels and a clear stream. Before you is one last haul to the pass, a half hour zigzag up to 4,650 meters. Pray for a cloudless day, because the view from the pass is spectacular, especially towards the Yungas jungle far below the surrounding peaks. You can appreciate the logistical value of this road which connects the high plateau zone with the subtropical Yungas region, crossing the Cordillera Real of the Andes where you are now standing.

When I reached the pass in October, the valley lay under thick rain clouds. After such a grueling climb, what a disappointment! Clouds frothed up out of the valley and seeped through the pass, cutting visibility to 10 meters. Fog swirled around a mojón — a Spanish term for the rock mounds along the trail. I followed the Andean custom and tossed a rock on the pile, an act which, it is said, lightens the traveler's burden. Just through the pass, a mine tunnels deeply into the mountain — handy shelter should it be raining or snowing.

If you have had to walk all the way from Ventilla, you will need to hustle to reach Takesi before dark. In the village, there is a shelter for hikers. But if you have your own tent or plastic cover for protection against the frequent night rains, you can camp at either of the two lakes along the way and wake up to a splendid sunrise. The



THE VILLAGE of Takesi — spread out, the low houses of natural rock and straw thatch blend in with the rocks and grass of the high narrow valley.



THE STONEWORK of the Takesi Trail actually predates the Incas. The road was used by the Aymara in the Tiahuanaco period.

first lake is Lurukeri, the second Hiska Warawarani. The pairs of large white fowl on their banks are Andean geese (Chloephaga melanoptera).

Sauntering down to Takesi, you pass a small settlement on the right — another copper mine. The quiet, curious girl who watches you pass may be the same Magdalena. Looking back more than once, we saw her sitting on the wall — a lonely figure, waving.

Takesi is a good hour and a half beyond the mine, down an impressive stone paved trail so wide one truly feels it must have been a 'road.' Running along beside, the Takesi River tumbles white over rocks and down small waterfalls.

If you reach Takesi in the late afternoon light, you may wonder if you are in a village at all. Spread out, the low houses of natural rock and straw thatch blend in with the rocks and grass of the high narrow valley. The trail meanders between corrals. Voices mark your passage from inside dark entrances — a village of caves enclosed on three sides by steep mountains, a village under clouds that rise at night to cover the valley.

We came upon an old, old man, a bent over figure trudging along, leaning on a stick. He wore a miner's helmet and yellow parka, as do all the men in these rainy mountains. He complained of not being able to see in the grey twilight, but even so, led us to an open-sided, thatched shelter. After some hesitation, we bedded down on the warm, dry, soft manure. You get used to the smell after a few minutes.

If you do the hike in two days, the second day is just as long, but downhill and more beautiful. A half hour out of the village, you must cross a footbridge less dilapidated than it appears at first. Note the pre-Columbian foundation! Should you need shelter along here, there are caves before and after the bridge, and another small cave some 15 minutes ahead on the left. From this last cavelet, you can look out on the trail winding around the slopes far ahead, high over the stream bed.

Another 15 minutes and the trail bends sharply to the right in a nicely banked curve, backed by a huge, sculpted boulder — an Inca guard rail. You

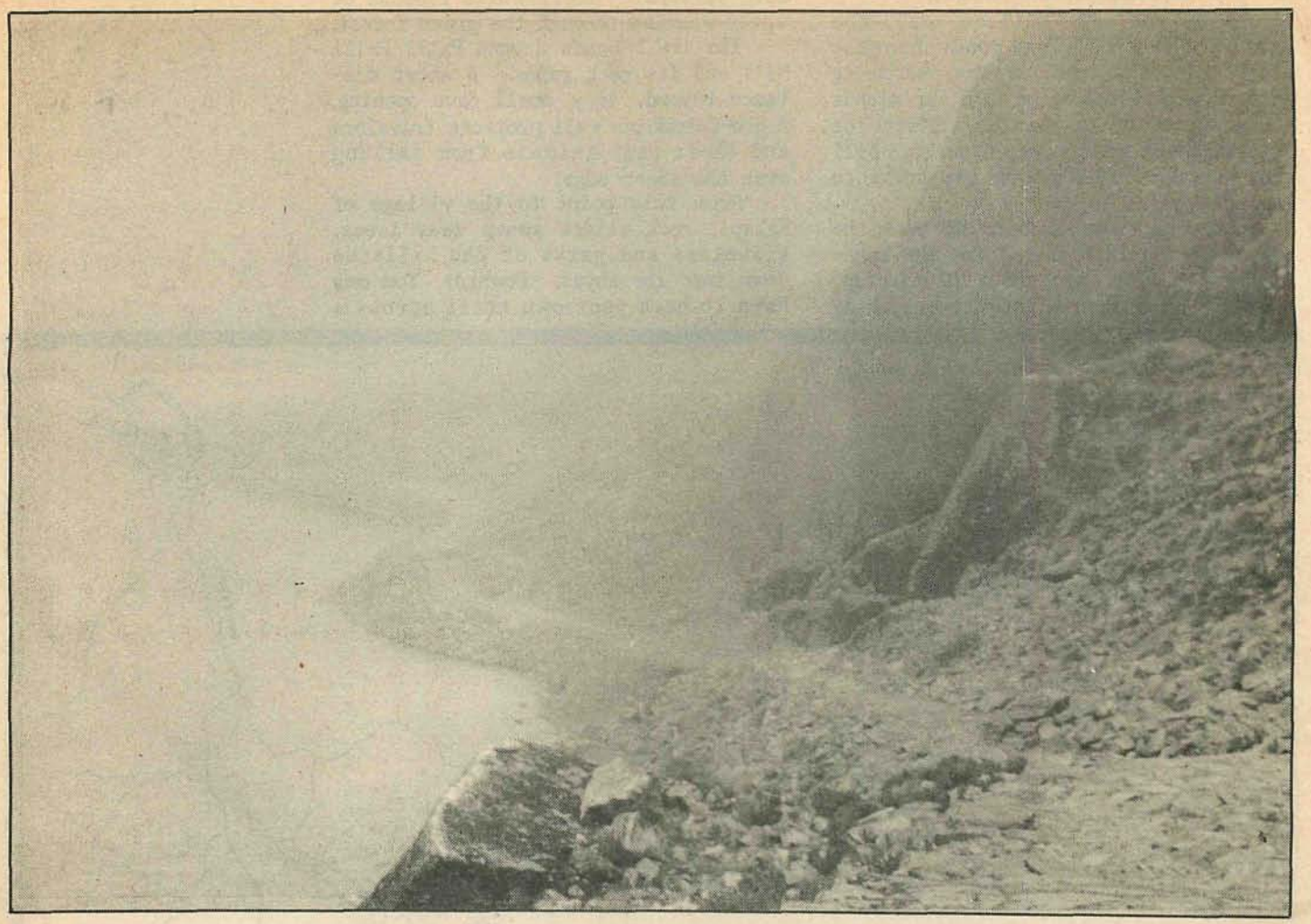
are now in semitropical jungle.

Enjoy the next half an hour, the last of the wide 'Inca road,' because after this, the road narrows, becoming a trail that winds up around the slopes you saw previously towards a streamlet dripping over moss-covered rocks. Fill your canteen. It will be two hours to the next water.

Lofty snow peaks loom up over the valley on the left that joins the Takesi River Valley. In about 20 minutes, you will come upon a ledge overlooking both valleys — their white ribbons of water weaving through the green forest.

The trail bends around Palli Palli Hill and its rock ruins. A short distance beyond, is a small cave opening. A pre-Columbian wall protects travelers and their pack animals from falling over the sheer edge.

From this point to the village of Kakapi, rock slides sweep away trees, travelers and parts of the hillside down into the abyss. Beware! You may have to hack your own trail across a



BEYOND the pass, you can camp at either of two lakes and wake up to a splendid sunrise.

slide.

In less than a hour later when you see a quaint, but decrepit church, you are in beautiful Kakapi, a cluster of houses, each surrounded by flowers.

Upon entering the village, you will pass a small, walled water source. Rather than drink here, I advise waiting the half hour it takes to reach the River Sochikachi where the water is fresher. From the wooden footbridge at the Sochikachi, it's a fast hour's walk, or a little more, to the cement footbridge across the Takesi River, the lowest point on the hike at 2,100 meters. If it doesn't look like rain, take your time going up to the saddle pass, stopping to smell the trumpet lilies among the ruins of the two-story rock complex or ponder the sign on a little church stating: 'IGLESIA EVANGELICA — NAL, Los Amigos, Monte Sinai.'

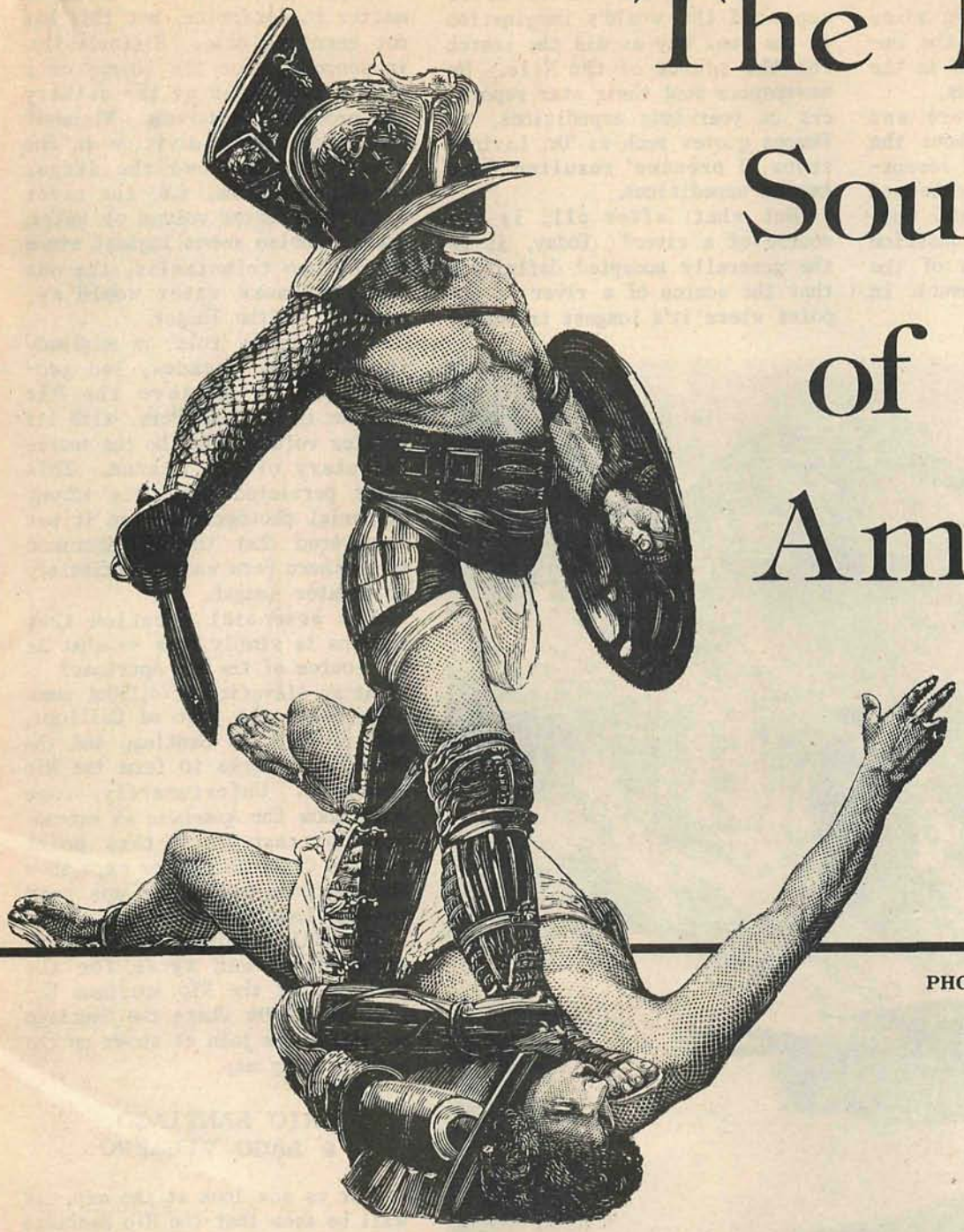
I like to think the trail ends at the Takesi River. There is still a two-hour walk uphill, but it is a dreary stretch. To reach Chojlla, pass the watergate house. Continue along a dirt road with aqueduct and water works, and up the steps of the shanty town — a horrid and miserable mess like mining towns everywhere.

The buses for La Paz leave Chojlla only at 7:00 am. Spend the night down by the river, in the local schoolhouse or take a pleasant hour and a half stroll down the road to the pretty village of Yanakachi and overnight in the cozy Hotel Panorama. Bargain with the woman in charge! She furnishes candles and serves meals. If you plan to stay in Yanakachi, buy bus tickets beforehand at the market area in Chojlla. You can catch the bus in Yanakachi the next morning.

The return ride to La Paz is a five-hour spectacle of lush vegetation, mountain streams, cliff-hanging curves and some two dozen waterfalls. In the rainy season, there is the additional spice of falling boulders and mud avalanches which occasionally wipe out whole sections of road.

It was while waiting behind 60 other vehicles on our side of a washed-out curve, that I finally got time to read all of Bradt's Backpacking and Trekking in Perú and Bolivia. It's a very good book. ■

The NEW Source of the Amazon



By Jerzy Majcherczyk

PHOTOGRAPHS BY THE AUTHOR

FIVE RIVERS, ALL IN PERU, HAVE AT TIMES BEEN CONSIDERED POSSIBLE SOURCES OF THE AMAZON -- THE APURIMAC, URUBAMBA, NUPE, HUALLAGA, AND MARANON. AND MANY ARE THOSE WHO PURPORT TO HAVE LOCATED THE TRUE SOURCE. THE FOLLOWING ARTICLE BY JERZY MAJCHERCZYK, NAMES A SOURCE OF THE AMAZON BASED ON THE AUTHOR'S EXTENSIVE STUDIES IN THE AREA. IT IS, IN THE OPINION OF THE SOUTH AMERICAN EXPLORERS CLUB, A CLAIM LESS FRIVOLOUS THAN MOST AND CONSIDERABLY MORE IMPRESSIVE THAN OTHERS WE HAVE EXAMINED.

It is commonly believed that the source of the Amazon is one of those questions long since resolved by geographers, the answer to which can be found in the appropriate reference books.

In point of fact, there was virtually no agreement about the source of the Amazon until recently, and although such an esteemed organization as the National Geographic Society deems the question closed, the actual source of the Amazon is still very much in dispute.

Strange to say, the search for the source of the Amazon never captured the world's imagination in the same way as did the search for the source of the Nile. No newspapers sent their star reporters on year-long expeditions, no famous quotes such as 'Dr. Livingstone, I presume' resulted from Amazon expeditions.

But what, after all, is the source of a river? Today, it is the generally accepted definition that the source of a river is the point where it's longest tributary rises.

This would seem to be a simple matter to determine, but this has not been the case. Historically, in searching for the source of a river, one began at the estuary and proceeded upstream. Whenever one encounters a division in the river, one follows the larger branch upstream, i.e. the river with the greater volume of water. Such a choice seems logical since of any two tributaries, the one carrying more water would apparently be the longer.

This simple 'rule' is misleading, and for decades, led geographers to believe the Río Marañon in northern Peru, with its greater volume, must be the source tributary of the Amazon. This error persisted until the advent of aerial photography when it was discovered that the Río Apurimac in southern Perú was the tributary of greater length.

The essential question that remains is simply this — what is the source of the Río Apurimac?

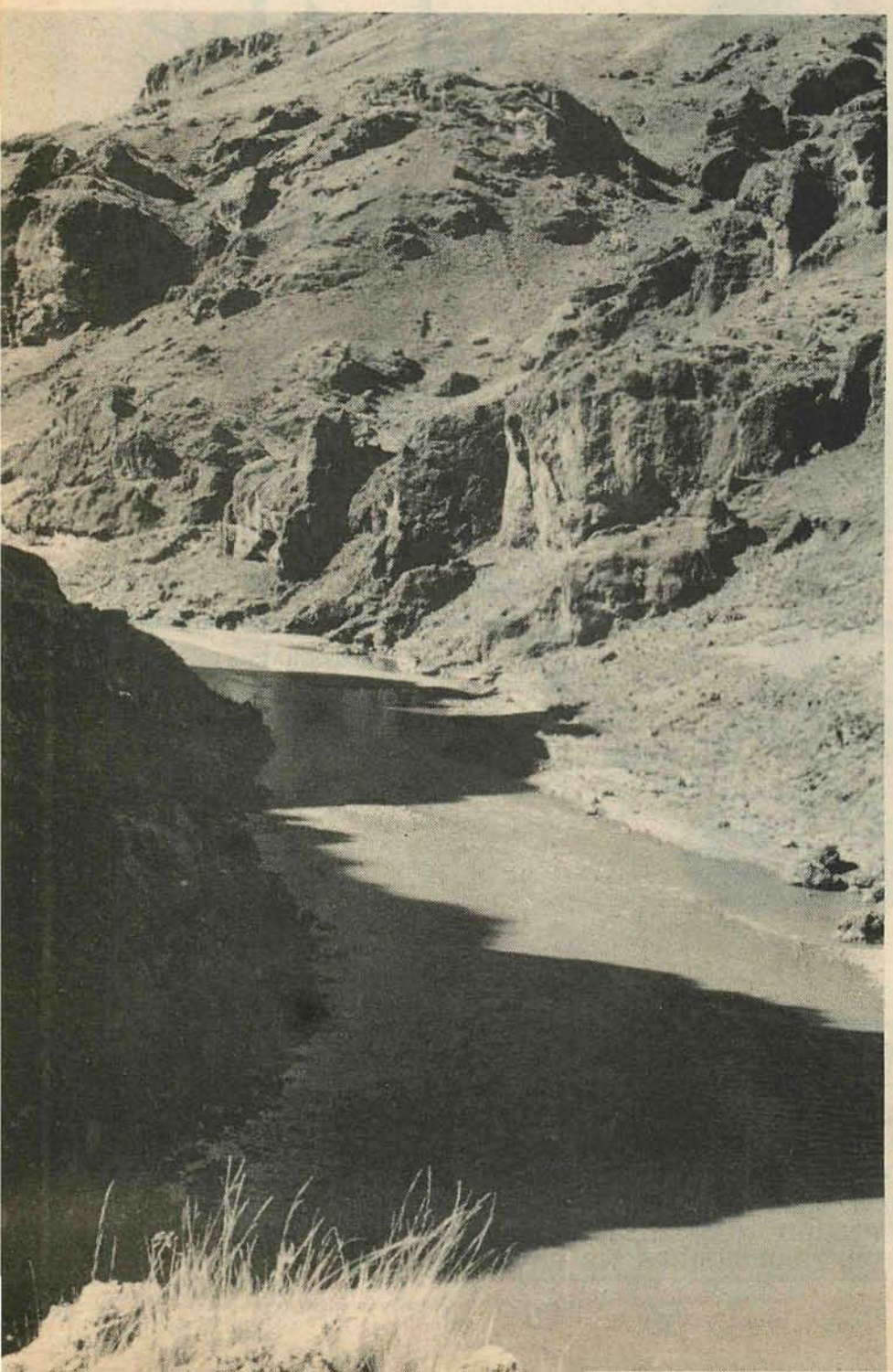
At an elevation of 4,130m, some 14km below the town of Cailloma, two rivers, the Santiago and the Hornillos, merge to form the Río Apurimac. Unfortunately, some maps show the Apurimac as extending upstream from this point towards Cailloma. Other maps show the Apurimac extending upstream towards Lago Carhuacocha.

It will eliminate much confusion if we can agree for the moment that the Río Apurimac begins at 4,130m where the Santiago and Hornillos join as shown on the accompanying map.

RIO SANTIAGO & LAGO VILAFRO

Let us now look at the map. It will be seen that the Río Santiago rises at an elevation of 4,545m from the merger of two streams — Hevajo (8km long) and Cuchillados (5km long) — both of which rise at an elevation of 4,900m from beneath the mountain peak of Cerro Huagra (5,240m).

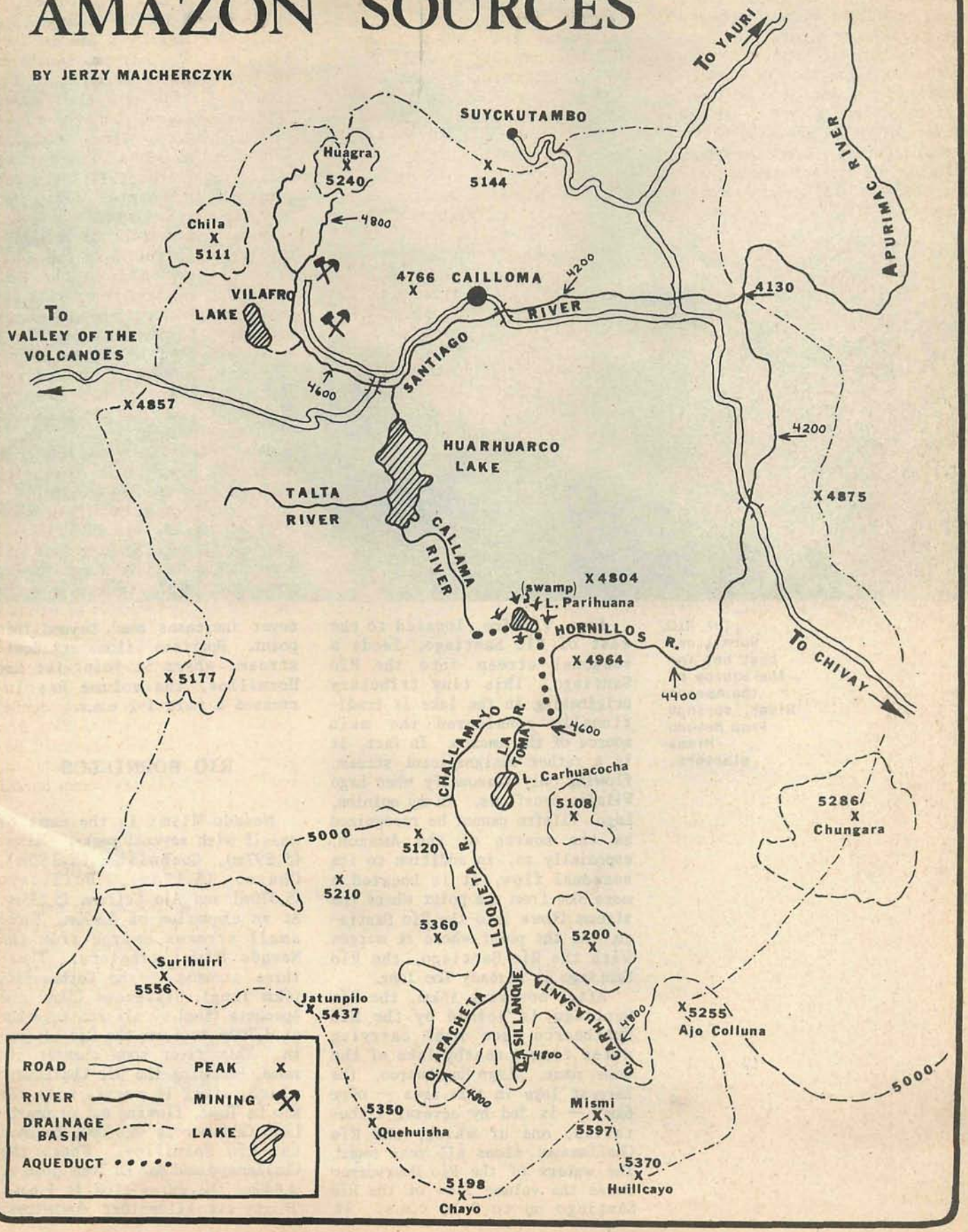
Where these two streams merge, the resulting Río Santiago has a flow (July 1981) of 4-5 c.m.s. (cubic meters per second).

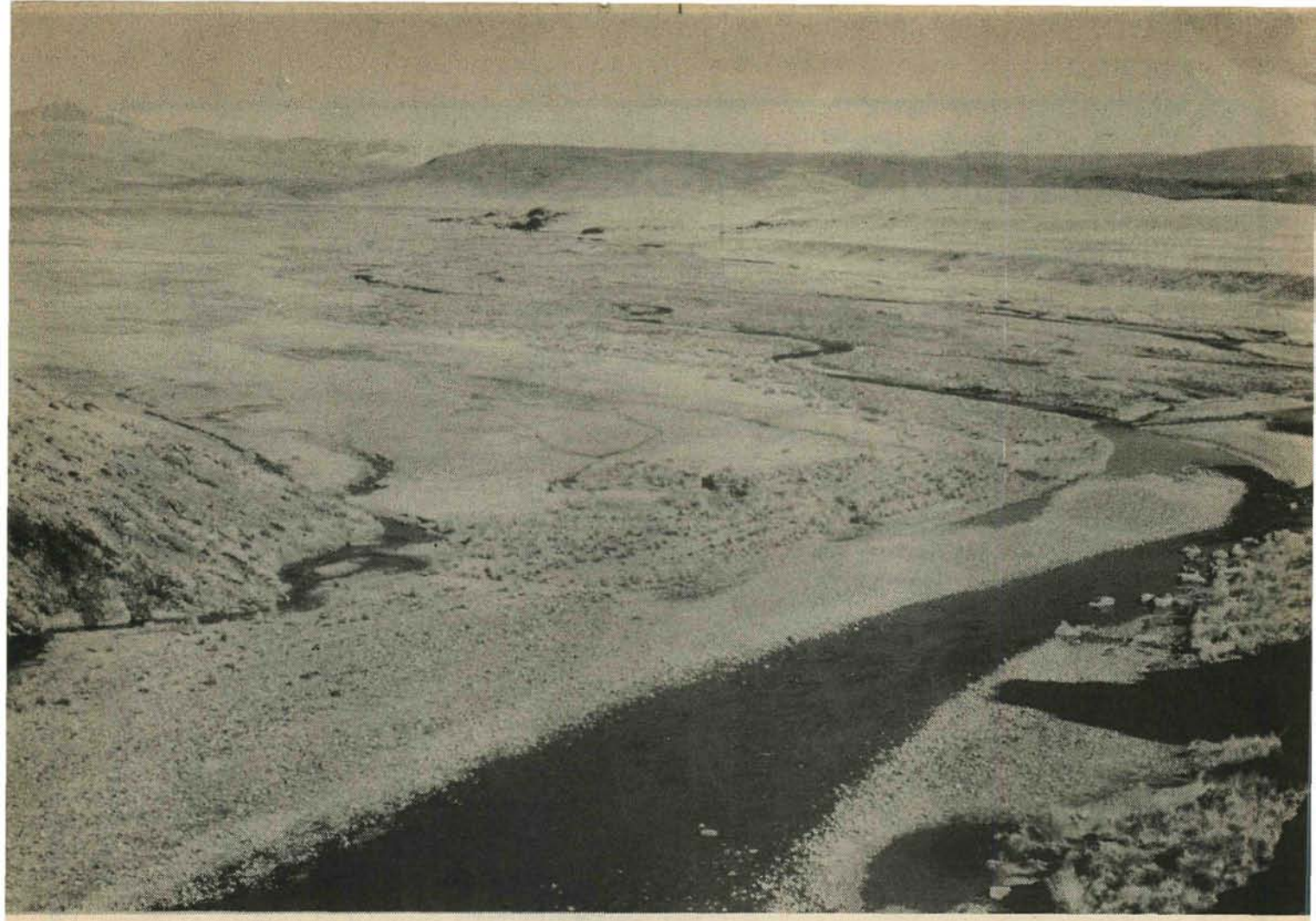


RIGHT: Map of the source rivers.
LEFT: The Río Santiago.

AMAZON SOURCES

BY JERZY MAJCHERCZYK





THE RIO Hornillos, best bet for the source of the Amazon River, springs from Nevado Mismi glaciers.

Lago Vilafro, located to the west of Río Santiago, feeds a seasonal stream into the Río Santiago. This tiny tributary originating in the lake is traditionally considered the main source of the Amazon. In fact, it is a rather insignificant stream, flowing only seasonally when Lago Vilafro overflows. In my opinion, Lago Vilafro cannot be recognized as the source of the Amazon, especially as, in addition to its seasonal flow, it is located a mere 3km from the point where the stream flows into the Río Santiago. At the point where it merges with the Río Santiago, the Río Santiago is already 7km long.

After covering 15km, the Río Santiago is joined by the Río Huarhuarco (see map) carrying water from a nearby lake of the same name. Lago Huarhuarco, the largest lake in this area — over 6km^2 — is fed by several tributaries, one of which, the Río Challamayo, flows all year round. The waters of the Río Huarhuarco raise the volume flow of the Río Santiago up to 9-10 c.m.s. It never increases much beyond this point. Fourteen kilometers downstream, where it joins the Río Hornillos, the volume has increased a mere 1-2 c.m.s.

RIO HORNILLOS

Nevado Mismi is the name of massif with several peaks: Mismi (5,597m), Quehuisha (5,380m), Chayco (5,198m), Huillcayo (5,370m) and Ajo Colluna (5,255m). At an elevation of 4,900m, three small streams emerge from the Nevado Mismi glaciers. These three streams — the Carhuasanta (6km long), Sillanque (5km) and Apacheta (5km) — all run together at 4,700m to form the Río Lloqueta. This river soon changes its name, becoming the Río Challamayo which, after it merges with the Río La Toma, flowing out of nearby Lago Carhuacocha (4,640m), becomes the Río Hornillos. Where the Challamayo and Río La Toma join at 4,640m, the water flow is 4 c.m.s. Thirty-six kilometers downstream

from this point, as it passes under Pillunes Bridge on the Chivay-Cailloma road, water flow has increased a meager 1-2 c.m.s. Rather puzzling. One could reasonably expect a greater volume after such a long stretch.

Furthermore, where the Río Hornillos joins the Río Santiago to form the Río Apurimac, the Río Hornillos has traveled 78km from its source, the Río Santiago 38km, i.e. the Río Santiago has traveled less than half the distance of the Río Hornillos, but curiously its water volume is almost double that of the Río Hornillos.

How to explain this? The answer lies at 4,580m or 50km up river and just a few kilometers below the point where the Río Challamayo joins the Río La Toma to become the Hornillos. Here an earthen aqueduct (actually a large, man-made ditch) siphons off fully 80% of the Hornillos flow into Lago Parihuana. On the west side of this lake the ditch continues draining water and augmenting the source waters of the Río Challamayo. The Río Challamayo, in turn, flows into Lago Huarhuarco which, as we noted earlier, feeds into the Río Santiago.

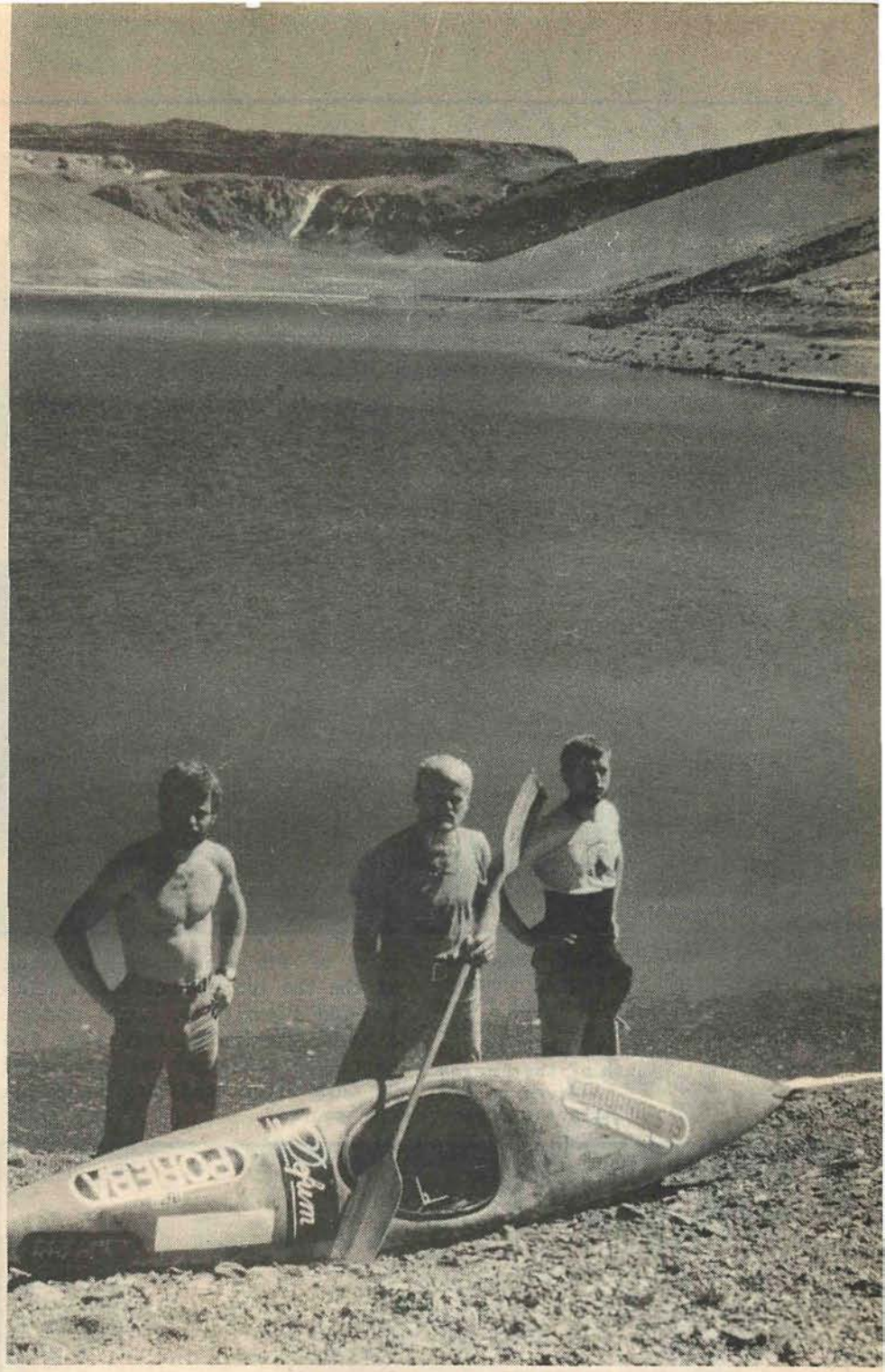
In short, the two river systems are artificially connected — a man-made ditch accounts for the unexpected water volume found in the Río Santiago and Río Hornillos where they join to form the Rio Apurimac.

More importantly, the existence of this ditch means that Mt. Huagra cannot be the source of the Amazon. Maps depicting the Río Santiago and/or its tributaries as the source are incorrect.

Had the ditch not been built, the Río Hornillos would merge with the Río Santiago with a flow of 10-11 c.m.s., and the Río Hornillos would reach the same point flowing at 7-8 c.m.s. — almost precisely reversing the present situation. Since the Hornillos is both longer and, in its natural state, the larger of the two rivers, it would seem to me to have a much better claim as the true source of the Amazon.

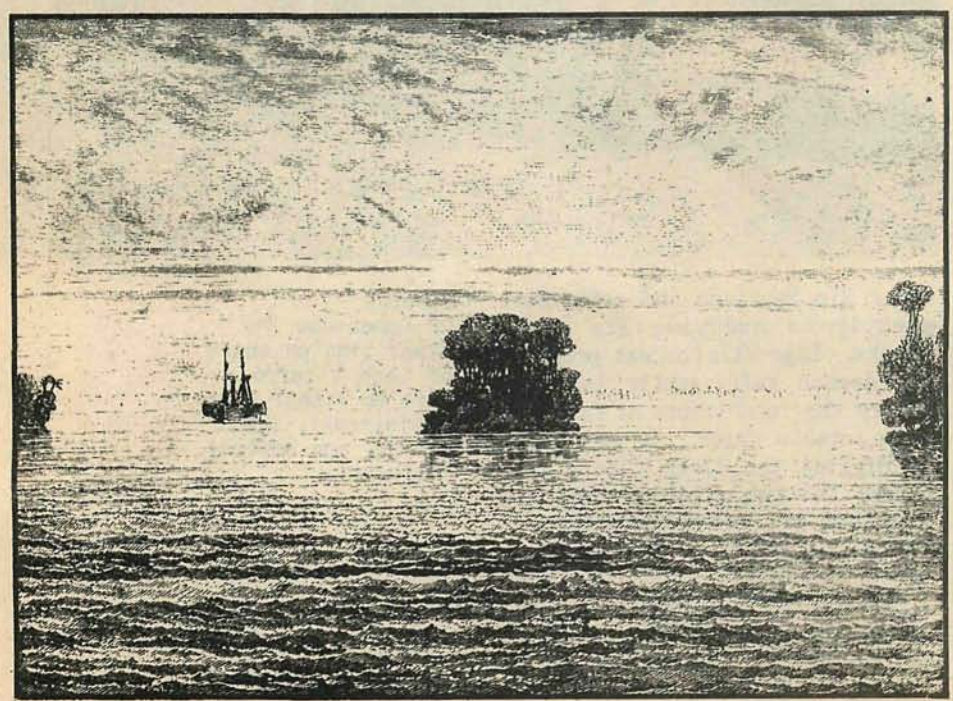
The aqueduct, or ditch, apparently was constructed about the same time as various mines that can still be seen on the upper Río Santiago and contribute greatly to muddying its headwaters. Lago Vilafro was probably not deemed sufficiently large to supply the inhabitants of Cailloma with potable water. In any event, by digging the 12-km ditch, they linked the two river systems and siphoned off water from the Río Hornillos into the Santiago via Lago Huarhuarco.

Whatever the actual historical events that led to construction of the aqueduct, the fact remains that the first explorers didn't



MEMBERS OF Canoandes '79 Expedition on shore of Lago Vilafro. Left to right: Piotr Chmielinski, the author, and Andrzej Pietowski.

ABOVE: Quebrada Sillanque, through which the first Amazon source waters flow. BELOW: The mouth of the Amazon River on the Atlantic Ocean.



know of its existence. Arriving at the the juncture of the Santiago and Hornillos, they understandably designated the Río Santiago the larger and proceeded up this river believing it to be the source.

So what is the true source of the Amazon? The Río Hornillos. But the confusion is likely to persist. For one thing, no less than the prestigious National Geographic Society has endorsed the Río Santiago that springs from Mt. Huagra as the official source.

For another, there is an ongoing problem with names in Perú. It is not uncommon to find multiple and frequently contradictory names for the same river, mountain, etc., on different maps. Furthermore, map names are often at odds with local usage. For example, the Río Santiago which flows through the city of Cailloma is listed on some maps as the Río Apurimac. This is not just confusing, it is misleading. Better to show the Río Apurimac as forming where the Río Santiago and Hornillos merge. Indeed, if the Apurimac is viewed as extending upstream beyond this juncture, it is preferable that it be along the Río Hornillos. This would likewise simplify matters by eliminating many confusing names on such a short stretch of river. ■

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Jerry 'Rock' Wright pulled the still smoking pipe from his firm mouth while artfully nosing the twin engine Cessna down through a dark, potentially threatening cloudbank. With an easy twist of his thick, well tanned wrist, he ably eased the small craft into bright sunlight.

'Well,' he began calmly, pointing a lean, athletic forefinger at the cockpit window, 'there it is.'

No sooner had the words left his mouth when a vast and verdant 200 million acre tropical tapestry leapt into view 3,000 feet below.

'The Darien,' Rock declared, barely concealing his excitement.

'Yes,' I confirmed. 'The Darien,' but the sprawling sea of undulating greenery which has ably prevented a land route between North and South America since the beginning of time hardly needed an introduction.

'Truly a fantastic expanse of pristine, primordial and untamed wilderness virtually unpenetrated by modern peoples since time in memoriam,' I noted, with a characteristically deep appreciation for untouched, natural beauty and strange primitive peoples.

'Right,' agreed Rock, refilling his briar from a well-worn, though still handsome tobacco pouch. 'And it will be even better when the 'dozers get done with it,' he added with a deep appreciation for mammoth earthmoving equipment and reinforced concrete.

A former captain in the United States Navy's famed Seabees, Rock, with his legendary platoon of Kentucky strip mine engineers had graced countless jungle environments with airfields, munitions dumps and concrete bunkers during the halcyon days of World War II. His heroic ditching of a C-141 laden with 300,000 sacks of ready-mix concrete in the Jap water supply at Iwa Jima, turned the tide of battle, won him a Purple Heart and created a five-acre tennis court (the largest in the South Pacific) still in use today.

Yet, even that feat pales in comparison with the challenge which brought Rock (and myself) to the fabled Darien.

A desolate, tropical abyss separating the Spanish-speaking countries of Panama to the north and Colombia to the south, the Darien Gap is one of the world's last untouched jungle environs. Home to at least two aboriginal tribes, its combination of low lying swamp, thick forest, and voluminous rivers boast perhaps the most plethoric pageantry of plant, animal and marine life anywhere in the world.

Cunning black panthers, bull throated howler monkeys, venomous bushmasters and colorful, yet benign toucans are but a few of the species which romp there in pronounced, untamed profusion.

Yet with all these attributes, the Darien is not without faults. Inconveniently located by nature in the path of the Pan American Highway about 70 million years ago, the wasteland's sprawling muck

has crippled fruit exports and completely demoralized respectable coffee bean producers. And while a screeching paradise for carnivorous beasts and ill-behaved reptiles, the isolated inhabitants of the Darien remain mired in the most primitive existence imaginable.

'Subsisting on raw fish and wild bananas (often bruised), the ill clad natives have yet to hear of, let alone taste, an adequate Quiche Lorraine,' according to a detailed survey by the United Nations SubCommittee on Distastefully Underdeveloped Nations (UNSDU).

'Rudimentary cooking utensils — electric woks, microwave ovens, variable speed blenders — are wholly absent, while the tradition of brunch is apparently unknown. Basic consumer staples — car wax, digital watches and monogrammed bathrobes — are as foreign to them as a decent tax shelter or the Super Bowl.'

It was the sort of naked barbarism which most Americans have only read about in National Geographic or seen on color TV. Yet, as we gazed from our motorized aerie upon a savage world devoid of American Bandstand and instant breakfast drink, we knew the future would be different.

Officially titled 'Operation Fill-in-the-Gap' (OFIG), Rock and his Seabee crew, now successful developers of aerially-dropped concrete tennis and handball courts, had been commissioned by the United Nations' Task Force on Inter-American Affluence (IAATF) to bulldoze a path to prosperity across the Darien.

Phase one, 'From Dugout to Diesel,' would persuade natives to take up farming by diverting 72 major streams, raising hydroelectric dams on the region's three principal rivers and constructing an initially modest eight-lane freeway through some seven unproductive sanctuaries for endangered species.

As well as being instructed by foreign missionaries to read, write, boil drinking water and floss their teeth, displaced native personnel would be offered low-interest loans on mobile homes with attractive bike and jogging trails winding through ancient burial grounds.

Nearby, accredited business schools will streamline and update outmoded cultural myths, while in badly needed hospitals, tribal witch doctors, once licensed by the American Medical Association and adequately insured, will practice along side interning U.S. surgeons.

Traditional rituals will live on in rustic wine and cheese theaters open from May to September, to attract foreign tourists — an ongoing market for the local handicrafts to be sold from boutiques and stalls along an adjacent shopping mall.

'Of course we expect a little resistance to change,' noted economist Prof. Kurt Von Runstadt, IAATF chairperson and author of Blowdarts to Software: A Primer for Primitives. 'It's much easier to dance around all day for no apparent reason than to go out and get a decent job. Like everybody else, they'll have to learn. There's no such thing as a free lunch — or even a free banana.'

But as Rock and I soared high above a world which needed a guiding hand and indoor plumbing, we realized that the Darien could look forward to even more than designer jeans and the cocktail hour.

'They'll have their own big rigs someday, said Rock, lifting his eyes from the now brightening

expanse below and sending a knowing glance my way.

'With air conditioning and CB radios if they're lucky,' he continued waxing optimistic.

'If that can happen,' he went on, his voice rising to a crescendo while his broad hand tapped loose the spent ashes from his pipe, 'can democracy be far off?'

It was an almost unfathomable dream, yet deep down we knew that someday the Darien would enjoy the right to bear arms, wage war and raise taxes.

'You know, it's a long road to freedom,' said Rock with penetrating insight and firm conviction.

'But it's a hell of a lot longer when you've got to build it yourself through a stinking swamp.'

In silence we gazed transfixedly below to where the enormous bulldozers would till the soil for the seeds of self-government.

Rock's bold vision called for defoliating a narrow, pre-marked swath through the Gap. Helicopters using a mild napalm derivative, then airdropping 75 hand-picked, bilingual Green Berets to survey the route and befriend the populace.

Shock troops of the Army Corp of Engineer would move in soon after to 'neutralize problematic waterways.'

'After that, it'll take a lot of Hershey bars to win back the people's confidence,' Rock said with deep compassion. 'But then progress is never popular.'

Once graded and levelled by laser-equipped Caterpillar earthmovers, eight formations of B-52 aircraft will saturate the 200-mile-long steel reinforced route in pinpoint, low-level 'bombing' runs using shells detonated to release 800 pounds of pre-mixed concrete only seconds before striking the ground.

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'Maybe the whole thing has a snowball's chance in hell,' said Rock with utter candor. 'But I've always said it's better to drop a ton a 'crete than curse the damn muck.'

Deep inside I knew the old Seabee was right. We'd be lucky to have a dirt road, a couple diesels and a mild dictatorship in the end, I thought to myself, but it was worth a try.

Yet at that moment, it was the impassable jungle itself and not the majestic dream of an all-electric Darien which occupied my attention. For long before the first Green Beret, ton of defoliant or yard of concrete could spiral majestically earthward, a route would have to be found through the impenetrable green hell of marsh and muck.

Until then, the Darien would remain in its deep, primordial grip. **(To Be Continued)**

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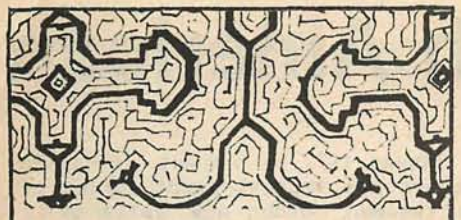

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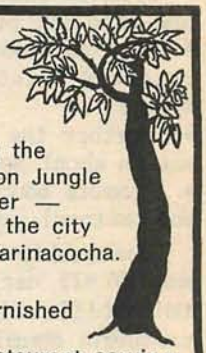

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The Club's purposes are to:

- Advance and support all forms of scientific field exploration and research in the field sciences as well as such sports as white-water running, mountaineering, caving, hiking and others.
- Promote wilderness conservation and wildlife protection.
- Publish research in the natural sciences, history and adventure sports.
- Further the exchange of information about South America.
- Promote educational, scientific and cultural programs.

Membership is open to women and men of all nationalities, subject to ratification by the Club's executive committee.

Four issues of the South American Explorer are included in the Club's US$25 annual membership fee, plus other benefits, such as discounts on books, maps, etc. sold by the club, use of the Club's information service, library, reading room, equipment storage, mail pick-up and use of other facilities.

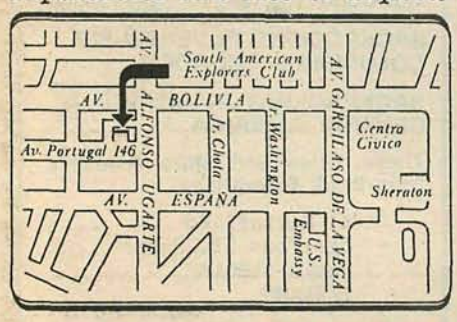
Subscription only costs ~~US$5~~ for four issues.

Overseas airmail postage is US$7 for four issues.

Members are not permitted to use the Club or its facilities for commercial purposes or personal gain.

The South American Explorers Club welcomes contact with other organizations sharing a common purpose.

The South American Explorer is interested in receiving articles about South America. Editorial requirements sent free on request.



Map showing how to find the Clubhouse in downtown Lima, Peru.

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#4 Fool's Guide to Climbing in Ecuador and Peru by Michael Koerner, 1978. The best little pocket guide to climbing in Ecuador. Charmingly written with much useful info and sketch maps for the serious climber.

#5 Exploring Cuzco by Peter Frost, 1980. The traveler's guide to Peru's most famous region: Cuzco, Sacsayhuaman, Machu Picchu, Inca Trail, Sacred Valley, Vilcabamba. Second revised edition.

#6 Trails of the Cordilleras Blanca and Huayhuash of Peru by Jim Bartle, 1981. Descriptions of 26 hikes and more than a thousand kilometers of trails amoung the 6,000-m peaks in north central Peru, 16 pages of color photographs, eleven individual trail maps, fold-out map of the entire region.

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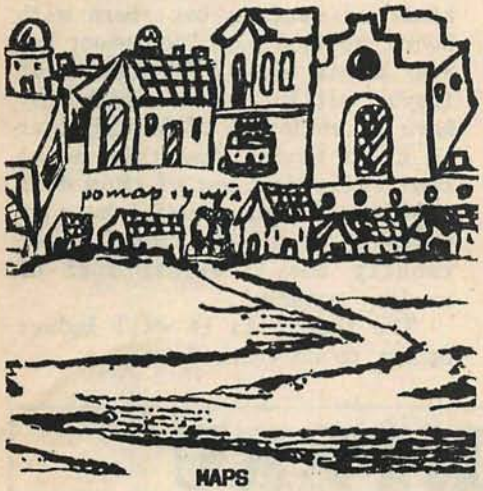
#7 In Kayak Through Peru. Whitewater guide by Polish expedition, Canoandes, 1981. The only comprehensive kayaking and rafting guide to Peru's major rivers. Includes maps, hydrographic data and photographs. In limited supply.



MAPS

#8 Road Map of Peru, 1982, first edition, 1:2,200,000, 96 X 67 cm color topo showing political divisions, roads and distance chart.

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Please make mention in any correspondence you feel impelled to despatch to your Club what a thrill it is to get a South American Explorer almost on time and what an exceptionally good issue it is, at that. This way, you will beat the critics and virtually assure publication of your letter in our 'Letters to the Editor' section which is absent in this issue due to surprising dearth of complimentary epistles in recent months.

Do not write us about what looks like a new format, i.e. the fact that certain sections of the magazine are missing, to wit, Tips and Notes, News, and Book Reviews. Your editors are quite aware of the omission, and if we can live with it, so can you.

Lonely Lisa

Jim Bartle recently wrote in despair to say that he believed it was The London Times which named Peru the 'world's most dangerous tourist destination.'

You can imagine what this and other reports of terrorist activity have done to the once encouraging flow of traffic through the Club in Lima. No longer the buzz of expeditions being planned, the leisurely slurping of coffee, the snapping of leg pouches. Lisa Mosczynski, the Club Manager, now sits atop the marble staircase waiting mostly in vain for the rare visitor.

Hotels have slashed their prices, restaurants look forward to bankruptcy and, as usual, inflation spirals upward for lack of the almighty buck, pound, mark and yen.

If this state of affairs continues, we'll have to close the Lima offices. We can hardly maintain a lavish establishment in the Peruvian capital if our members are touring Europe or visiting the Far East.

Must we point out yet again that the tourist is probably safer in Peru than in his home country, especially if he/she comes from Chicago or Detroit. If you have plans to visit Peru, now is the time. Put away your newspapers and buy a ticket. Imagine having Machu Picchu all to yourself, the friendly waiters, the inexpensive hotel accomodations. Best of all, imagine how gutsy you'll appear when you get back home. Only you and your Club will know what a cheap chicken you are.

The Decent Thing

Dan Buck and Anne Meadows called the other day to say that they will be bringing $300 worth of books about South America with them on their trip from Washington, DC, to Denver. They plans to donate these tomes to the South American Explorers Club.

So what, you say! Well, if this weren't such a rare event, it wouldn't be news and we wouldn't have to write about it. But the awful truth is that there are all kinds of members out there with books, antique maps, equipment and who knows what all else, that they're sitting on and which they have no intention of handing over to their Club. And this means that everytime one of them does the decent thing, we'll have to write it up and say thanks — not exactly the liveliest sort of reading material.

The theory is it will induce others to do their duty.

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